INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 75 NOVEMBER, 1942 NUMBER 5

RESULTS OF THE TREATMENT OF METASTATIC CARCINOMA IN THE CERVICAL LYMPH NODES

A Collective Review of the Recent Literature

HARWELL WILSON, M.D., F.A.C.S., Memphis, Tennessee

A STUDY of the literature of the past ten years regarding metastatic cervical cancer reveals a wide diversity of opinion in regard to methods of treatment and selection of cases for treatment and a lack of conclusive and comparable evidence concerning end-results. In both the surgical and radiological literature the impressions of the author are often given without concrete evidence in support of his views. "Cures," for instance, frequently are mentioned without specific data as to the time interval involved. Many writers report results on cases selected in an arbitrary manner which renders the interpretation of results especially difficult when applied to all patients with a given type of lesion.

The diversity of opinion extends to the time and manner in which the various methods of treatment or combinations of methods are used, namely, surgery, x-ray, and radium. Generalizations are numerous as to which method various authors consider to be the therapy of choice. Comparable figures, therefore, on results are relatively rare with regard to the group as a whole or to specific sites of origin. Most of the reports are based on cancer of the lip. It should be pointed out, however, that the lymphatic spread of cancer may vary according to the primary site, and results, therefore, should be studied in terms of the source of origin of the metastases (85). The results which are presented in the literature should also be interpreted in terms of the various opinions in regard to selection of cases and treatment.

This review endeavors to follow such a plan and covers the period from 1932 through 1941. Much had been written before 1932 on metastatic cervical cancer, the literature tending to emphasize radical surgery. Recognition is due among others to Kocher, Cheatle, Bloodgood, and Crile for pioneer work in the treatment of metastatic cervical cancer by radical surgery based on a clear conception of the anatomy of the cervical lymphatics and the methods of cancer spread. The trend, as Duffy (20) points out, in the treatment of cervical nodes has progressed from radical surgery through extensive use of irradiation to a consideration of the uses of both methods either separately or in combination. It is believed that the period from 1932 to the present time will present all points of view. In this review the general problem will first be given consideration after which more attention will be given to metastases arising from specific sites of origin.

Cervical metastases arise from a variety of primary sites. Table I shows the location of the primary lesion in 500 consecutive cases of metastatic cervical cancer reported by Hayes Martin in 1941 from the Memorial Hospital in New York (53).

This table demonstrates the wide variety of primary locations which may give rise to cervical metastases. In a thorough consideration of the question one must consider not only the general problem of treating cervical metastases but also the problem as it is related to the various specific sites of origin. Most authors emphasize the fact that the primary lesion must be controlled, or that a reasonable chance of cure must exist, before one is justified in adopting radical procedures designed to cure the patient of cervical metastases (53, 19, 25, 92). It is now generally

From the Department of Surgery, University of Tennessee, Memphis, Tennessee.

TABLE I.—LOCATION OF PRIMARY LESION IN 500 CONSECUTIVE CASES

	No.	Per cent
Tongue	127	25
Floor of mouth	44	9
Extrinsic larynx	44	9
Nasopharynx	40	8
Lip	35	7
Tonsil	34	7
Mucosa of cheek	28	6
Metastatic from undetermined primary	28	6
Jaws	27	5
Pharyngeal wall	24	5
Palate	20	4
Skin of face	11	2
Thyroid	11	2
Miscellaneous	27	5

(From Martin, H. E., *Ann. Surg.*, 1941, 114: 972)

TABLE II.—CANCER OF THE BUCCAL REGION (NOT INCLUDING PHARYNX) IN UNITED STATES REGISTRATION AREA

Location of cancer	Deaths		Per 100,000	
	1914	1935	1914	1935
Lip	376	727	0.6	0.6
Tongue	614	1,076	0.9	0.8
Mouth	230	550	0.3	0.4
Jaw	851	999	1.3	0.8
Other sites	199	600	0.3	0.5
Total	2,270	3,952	3.4	3.1

(From Kennedy, R. H. *Ann. Surg.*, 1941, 114: 813.)

held that in most instances cervical metastatic cancer develops as a result of lymphatic emboli rather than by direct extension (76, 78, 65). This view makes it rational to consider the treatment of cervical metastases as a somewhat separate problem from the treatment of the primary lesion.

PROPHYLACTIC TREATMENT OF POTENTIAL CERVICAL METASTASES

Prophylactic surgery. Since it is difficult to determine clinically in many instances whether metastases are present or not, the proper treatment of such cases has been the subject of much controversy. A large amount of evidence has been cited both for and against prophylactic cervical-node therapy, that is, treatment of the nodes before cancer is believed to be clinically demonstrable. The pendulum tends to swing back and forth. However, there has been no uniformity of opinion at any time.

Blair and Brown (3, 4, 5, 6, 7, 8) have repeatedly expressed a definite belief that in the majority of the cases of lip or intraoral cancer in which there is a reasonable chance of cure of the primary lesion, a lymph-node dissection of the neck should be done regardless of whether clinical involvement of the cervical nodes is demonstrable or not. Blair states that, in the majority of instances, patients who succumb to the disease do so as a result of the cervical metastases. He is also further impressed by the numbers of patients he has seen with cervical metastases in whom the primary lesion had been successfully treated without a lymph-node dissection of the neck and in many instances without the patient's having been urged to have frequent follow-up examinations. Blair (4) believes that neither clinical examination nor the routine histological examination of removed lymph nodes disproves the presence of carcinoma cells, and he stresses that "only the passage of time can disprove their presence." He cites 1 case that developed cervical metastases thirteen years after cure of a primary lip lesion. It is difficult to determine the exact success of treating carcinoma in nodes when the presence of cancer has not been conclusively determined, as in cases without biopsy treated by radiation.

Kennedy (42, 43, 44, 45) adopts a view similar to that of Blair in regard to prophylactic node dissection. Emphasis is laid upon the fact that while cancer is at first a local lesion, there is no means of determining how soon a metastasis may occur or whether it has already occurred until there has been progress in the secondary growth. Cure of the local lesion alone is futile if metastases exist, whether recognizable or not. Also, it is stressed that the metastatic growth is the usual cause of death. Kennedy (44) believes that a defeatist attitude among both surgeons and radiologists has resulted in indifferent therapy by both methods. He cites the death rates from various forms of oral cancer occurring in 1914 and 1935 as shown in Table II. Even though great strides have been made in radiation therapy, it is pointed out that the results for the general population show no improvement.

Kennedy points out that block dissections of the neck seem to be performed less frequently now than formerly. In spite of radiotherapy, the death rate has shown very little improvement in the past twenty-one years. In view of this, he believes that the surgical extirpation of nodes is not being done thoroughly enough.

Kennedy (44) also emphasizes that simply because the pathologist in a routine examination fails to find carcinoma in removed cervical nodes, one may not always assume that no metastases are present. Further, stressing that the absence

of palpable lymph nodes does not mean absence of carcinoma, Kennedy cites figures showing the variation of proved metastases following the removal of nonpalpable nodes. His figures show metastases in 14 per cent of his own series of 64 cases of carcinoma of the tongue without palpable nodes. Simmons and Daland (86) report metastases in 25 per cent of their cases in a similar series. Morrow (66) found positive nodes in 39 per cent of 18 cases of carcinoma of the tongue without palpable evidence of involvement. This evidence causes Kennedy to favor a neck dissection in most cases whether nodes are palpable or not, rather than dependence on follow-up examinations.

After a careful analysis of the first nodes involved by metastatic carcinoma in cancer of the lip, Kennedy favors limiting the neck dissection to a removal of the suprahyoid nodes in cases in which it is believed no definite metastases are present. It is believed that cervical metastases will occur in from 20 to 25 per cent of such cases. Figi's (26) mortality in 549 patients with suprahyoid dissection was .18 per cent. In view of these statements Kennedy says, "We believe the mortality for this operation should not be more than approximately one per cent. This would represent an immediate postoperative saving of 19 of the 20 per cent loss expected from cervical metastases. This low mortality effectively answers one of the arguments against prophylactic neck dissection" (44).

The figures cited on operative mortality for suprahyoid dissection reported by Taylor (92) in 1942 and shown in Table III are similar to the findings of Kennedy and Figi.

Morrow (66) observes that since successful treatment depends on keeping ahead of the disease, this can best be done by routine neck dissection whether nodes are palpable or not.

The following reports at various times also tend to favor prophylactic neck dissection: Figi (26), Fischel (29), Dixon (16), Swinton and Tromwald (89), Newell (70), Chase (10), Schuerch and Fehr (83), Roux-Berger (81), Hutchinson (36), Donati (17), Wookey (100), Crile (14), MacMahon (48), Tailhefer (90), Eggers (22), Twyman (95), Orton (71), Wilson (99), and Wangensteen (96).

Since 1938 a larger amount of material has been appearing in the literature opposing routine or prophylactic neck dissection in such cases. H. Martin (53) has presented evidence supporting this view in perhaps as clear a manner as anyone writing on this controversial subject. Martin frequently emphasizes the fact that surgery and irradiation should be complementary rather than competitive and that in the final analysis treatment of the individual case must depend upon clinical characteristics of the case as well as the experience of the surgeon and radiologist. It is pointed out that to be of value the prophylactic dissection must be done on a patient without palpable metastases in whom the primary lesion remains controlled and in whom metastases would eventually develop. Martin's statistics of patients with cancer of the tongue, lip, and cheek, as given in Table IV, show that only 12, 3, and 17 per cent, respectively, may have had benefit from the procedure. The mortality rate and morbidity involved are thought to be too great to justify prophylactic dissection. A careful follow-up program is stressed and operation is advised when definite metastases appear which seem operable.

Duffy (19, 20), also strongly opposed to routine dissections, believes that it is best to delay operation until clinical evidence of involvement is apparent. His frequently quoted criteria of indications for neck dissections are given in Table V (19).

TABLE III.—POSTOPERATIVE MORTALITY IN CASES WITH DISSECTION

Region	No. of cases	Deaths	
		No.	Per cent
Upper Neck	601	6	1.0
Neck (radical operation)	112	4	3.6
Jaw (resection)	58	5	9.0
Axilla	1224	29	2.4
Groin	260	10	3.8

(From Taylor, G. W. *N. England J. M.*, 1942, 226: 367.)

TABLE IV.—HYPOTHETIC LIMIT OF THE VALUE OF PROPHYLACTIC NECK DISSECTION

(Prophylactic treatment to the neck could have been of actual value only in those cases admitted without palpable metastases, in which the primary lesion was, eventually, permanently controlled and in which clinically demonstrable metastases appeared at a later date.)

	Patients admitted without palpable cervical metastases in whom the primary was permanently controlled	Patients who later developed cervical metastases
Cancer of tongue (1931–1934)	40	5 (12%)
Cancer of lip (1928–1932)	128	4 (3%)
Cancer of cheek (1930–1934)	12	2 (17%)

(From Martin, H. E. *Ann. Surg.*, 1941, 114: 974.)

TABLE V.—NECK DISSECTION

Indicated	Contraindicated
1. Primary lesion is controlled.	1. Primary lesion is uncontrolled.
2. Primary lesion is limited to one side of oral cavity.	2. Primary lesion extends to or beyond the midline of oral cavity.
3. Primary lesion is shown to be of highly differentiated cell type.	3. Primary lesion is shown to be of undifferentiated cell type.
4. Cervical metastases are present and limited to one group of nodes or nodes in two contiguous cervical triangles.	4. No metastatic nodes are present.
5. Capsule of nodes is not infiltrated by carcinoma.	5. Capsule of node is infiltrated by carcinoma.
6. Opposite side of neck is free of metastases.	6. Cross or bilateral cervical metastases are present.
7. No distant metastases are present.	7. Distant metastases are present.
8. Patient is in good general condition.	8. Patient is in poor general condition.

(From Duffy, J. J. *Am. J. Roentg.*, 1938, 39: 768.)

Taylor and Nathanson (94) in discussing this same problem state, "It is impossible to emphasize too strongly that adequacy of follow-up is the determining factor in the decision for or against prophylactic neck dissection in many cases. A policy of watchful waiting in regard to the neck is justified only if the patients will report regularly and conscientiously for examination. Ignorant or irresponsible patients and those who live at remote points or for whom transportation problems are difficult, should not be trusted to report regularly." Taylor and Nathanson base their discussion on the study of more than 5,000 cases of carcinoma which were treated in the Boston hospitals.

Quick (77) also opposes routine prophylactic dissection and expresses the view that the normal nodes tend to act as a barrier to carcinoma cells and in some instances may actually destroy a number of small metastases. Once the nodes are shown to be definitely involved by carcinoma, radical surgical extirpation is advocated, provided the nodes are "operable." Clarkson reports this same view (11).

Wile and Hand (98), Howes and La Rosa (34), Jacox (38), C. L. Martin (50), Moreland (65), Stewart (87), Ducuing (18), and Hyndman (37) tend to favor radical extirpation of the nodes only when there is clinical evidence of involvement.

Prophylactic irradiation. Prophylactic irradiation has been employed alone on patients showing no evidence of involved cervical nodes when a primary focus existed which might be expected normally to produce cervical metastases (2, 6, 74, 78, 11, 38, 97). Pfahler (74) uses prophylactic irradiation in treating nonpalpable nodes. He states that while there is little evidence in the literature to show that small doses of radiation destroy cancer, still, from his experience it seems to be beneficial. Quick (78) favors external irradiation when no nodes are palpable. Blair (6) gives neck irradiation whether nodes are resected or not. Clarkson (11) uses prophylactic irradiation and no prophylactic surgery. Widmann (97) reports a group of cases of which 17 per cent receiving prophylactic x-radiation and 51 per cent of those which were not irradiated developed metastases. Jacox (38) believes that x-rays are of some value in all cases and uses them even if no nodes are palpable.

Wile and Hand (98) report that high-voltage x-rays applied to regional nodes have been found unnecessary in cases without palpable nodes and useless if metastases are present. Moreland (65) and H. Martin (52) do not use prophylactic neck irradiation since there is no real proof that small doses will destroy cancer.

THE TREATMENT OF CERVICAL LYMPH NODES BELIEVED TO BE MALIGNANT BY CLINICAL EXAMINATION

Granted that the cervical nodes are believed to contain tumor cells, the method of appropriate therapy is still subject to much debate in the literature. Pflueger (75) in 1933 reported the results of questionnaires sent to 40 leading cancer authorities in the United States and abroad seeking to determine methods of treatment used for this condition. As a result of his survey, the striking differences of methods used became readily apparent. Pflueger's study showed, as does this review of the recent literature, that while in many instances authors tend to agree that often primary lesions may be controlled by either surgery or irradiation, there is often the greatest disagreement about the management of the metastatic cervical nodes which, after all, is probably the most important part of the problem.

Surgery. Even though the definition of "operable metastatic cervical cancer" is subject to great variation, radical surgery is still favored by the majority writing on this subject. Thirty-eight authors of those reviewed favored surgery provided their individual criteria for operation were present.

Indications for operation being agreed upon, various surgeons still differ regarding the extent of the operative procedure indicated, time of operation, type of anesthesia, and whether sur-

gery shall be combined with preoperative or postoperative irradiation. Earlier articles (based mostly on lip malignancy) frequently favored extensive neck dissections, namely, a block excision of the suprahyoid nodes combined with a radical removal of the deep cervical nodes from the level of the clavicle to the mastoid. Sometimes it was advocated that this procedure be done bilaterally.

The suprahyoid dissection has gained wide favor in recent years as the method of dealing surgically with cervical metastases from carcinoma of the lip. Quick (78) indicates the desirability of this method. As emphasized by Swinton (89), Kennedy (44), Dixon (16), Figi (25), and New (68), this method is a relatively safe procedure and certainly involves far less risk than the more formidable dissections. H. Martin (56, 57, 52, 53) and Quick (78) point out that this relatively conservative surgical procedure in metastatic lip cancer is useful because lip metastases are more prone to follow a definite pattern of involvement. These metastases tend to involve the suprahyoid nodes first. Also, if the lesion is located on one side of the mouth, the metastases usually occur on that side. Crossed metastases are, however, by no means rare.

If the primary lesion is on either the tongue, cheek, or floor of the mouth, the cervical metastases are apt to be much more extensive, and consequently the operation must be far more radical. In carcinoma of the tongue, one of the most discouraging forms, H. Martin (58) points out that the dissection must be radical, removing lymph-node-bearing tissue from the trapezius to the midline and from the mandible and mastoid to the clavicle. If metastases develop bilaterally many believe this to be a contraindication to operation. Tailhefer (90) favors bilateral radical dissection in treating metastases secondary to carcinoma of the tongue if bilateral involvement is found clinically. Brown (8) emphasizes that after removal of the nodes on one side, the opposite side must be constantly observed and operation instituted immediately when metastases are first noted. It is also pointed out by Kennedy (44) that if bilateral operation is done, the risk is greatly decreased by performing the operation in stages.

Time of operation. Lymph-node dissections have been performed at the same time that the primary lesion has been treated and in some instances before treatment of the primary lesion. Evidence now would seem to show definitely the desirability of carrying out the lymph-node attack after treatment of the primary lesion (65). This procedure involves less risk and also favors better wound healing with less likelihood of infection since the inflammatory reaction in the nodes frequently subsides after the original lesion is controlled.

Anesthesia. H. Martin (53) emphasizes the importance of local anesthesia in reducing the mortality from extensive neck dissections. New and Figi (68), Swinton (89), and Dixon (16) also favor this type of anesthesia. The advantages of local anesthesia are readily apparent in this group of patients when we consider that the majority are elderly individuals whose general condition is none too good. In numerous instances infectious material is present within the mouth which makes aspiration a very real hazard.

Preoperative x-radiation. Cohn (12) favors preoperative irradiation to retard or to shrink nodes. Kaplan (41) uses preoperative x-radiation before dissection. H. Martin (53) and Schuerch (83) emphasize that some apparently hopeless cases may be salvaged by administering irradiation which causes the tumor to regress to a point where operative excision may be accomplished.

Postoperative x-radiation. Postoperative x-radiation has also been used on the basis that if a few carcinoma cells are left after neck dissection, the radiation might cause their destruction. Swinton (89), Kennedy (42), Moreland (65), Johnson (39), and Lund (47) favor postoperative x-radiation following radical dissection if the nodes are found to be positive. H. Martin (52) thinks this is unjustified. He states, "From what is now known of cancer-lethal dosage, one to two S. E. D. will not sterilize epidermoid or adenocarcinoma and, in my opinion, there is no sound evidence that it can produce even a deterrent effect which will in any way modify the pre- or postoperative course."

Irradiation therapy. External irradiation alone is held by Howes and La Rosa (34), Cohn (12), and Martin (53) to be inadequate for the management of metastatic cancer of the neck except in an occasional very anaplastic tumor or when the process is confined to a very small area. This is because the normal tissue will not tolerate a dose of radiation sufficiently intense to insure complete destruction of all cancer cells.

It has been shown, however, in a number of instances that properly used external irradiation combined with interstitial implantation of radium or radon directly into the involved areas may result in controlling the lesion. Quick (76, 77) and Jacox (38) both emphasize the importance of this method, favoring the surgical exposure of involved nodes in order that the interstitial radiation may be accurately placed. C. L. Martin

(49, 50) also adopts this method but does not expose the involved nodes to direct view when placing the needles for irradiation.

H. Martin (60) has shown that carcinomacidal irradiation may be given to a very limited area in the neck with a small portal. This method may produce a cure when the metastases are limited to one or two nodes which can be covered by such small portals. It would be dangerous to apply large doses of irradiation to the entire neck, and Martin emphasizes the futility of using small doses when carcinoma is known to be present.

Interstitial irradiation is useful as an adjunct in an occasional instance in which all but a small bit of the carcinomatous nodes are removed. If a small area of carcinoma must be left because of fixation to a vital structure, an appropriate amount of radium or radon may be directly implanted in the area to good advantage. For palliation, both external and interstitial irradiation are frequently used in "hopeless" cases.

RESULTS OF TREATMENT

It would be helpful if one might compare the five-year cures resulting from comparable groups of cases treated by standard forms of therapy. Unfortunately, few studies have been published which lend themselves to direct comparison with other groups because of the variations in selection of cases included and the various methods used in treating cases in the same and other series (56).

The results given here will include reports of the group as a whole and those found dealing with cancerous nodes originating from specific sites. The latter type of report is usually of more significance since it has been repeatedly demonstrated that some lesions produce more widespread metastases than others. For example, cervical metastases resulting from carcinoma of the tongue usually are more extensive than are metastases from the lip, and the mortality of the former is, therefore, definitely higher.

TABLE VI.—NECK DISSECTION FOR CANCER—JANUARY 1, 1930, TO APRIL 1, 1934

(Successful Results in Cases with Histologically Positive Nodes)

	Total no. of cases	Five-year survivals	Lost, without recurrence
Cancer of lip	21	5	2
Cancer of tongue	18	2	0
Cancer of floor of mouth	5	3	0
Cancer of buccal mucosa	6	3	1
Cancer of tonsil	4	1	1
Cancer of salivary gland	2	1	1
Cancer of cervical lymph nodes (Primary undetermined)	1	0	0
Cancer of skin of head and neck (including melanoma of skin and orbit)	8	0	0
Cancer of lung	1	0	0
Cancer of extrinsic larynx	1	0	0
Lymphosarcoma of neck	1	1	0
Hodgkin's granuloma	2	1	0
Total	70	17	5

Total number of cases 70
Lost without recurrence ... 5
Total determinate group. 65
Five-year survivals 17
Net cure rate (17/65) ..... 26 Per cent

(From Martin, H. E. *Ann. Surg.*, 1941, 114: 983.)

RESULTS OF THERAPY OF CERVICAL METASTASES FROM VARIOUS PRIMARY SITES

Blair (3) in 1933 reports 27 per cent "cures" in a group of 74 cases with proved metastatic cervical cancer originating at various sites and treated by radical extirpation of the cervical nodes. These patients were well for periods of from five to seventeen years after treatment.

H. Martin (53) gives a five-year survival rate of 26 per cent for a group of 70 cases in which the primary cancer developed at various sites as given in Table VI. These cases were treated by neck dissection. The method of reporting results as used in this table by Martin is to be commended for its wider use by authors recording results on cervical-node therapy. This would result in a definite increase in the value of such reports.

Martin states in the same paper, "Since all nodes not treated by surgery, including the inoperable and hopelessly advanced and palliative cases, receive radiation, no cure rate percentage can be calculated for any significant comparison with neck dissection. It has been stated by some authors that there is no authentic case of a five-year cure of proven cervical metastases treated by radiation alone. In answer to such statements, I wish to place on record the data given in Table VII." This Table VII is given here showing results in a group successfully treated by irradiation. As stated, it is not possible to compare this group directly with cases treated by operation. It does show, however, some proved cures have resulted from the use of radiation.

Wookey (100) after studying 609 cases (338 lip, 101 tongue, 170 mouth) concluded in 1937 that surgery offered the best hope of control. There were no complete figures of value, however, on five-year cures.

Coutard (13) in 1932 reports 20 per cent five-year cures in a group of 212 patients having advanced cancer and treated by irradiation as follows:

46—cases of advanced cancer of the tonsillar region
89—cases of advanced cancer of the hypopharynx
77—cases of advanced cancer of the larynx
212—total cases
42—number of patients who were well after five years

Stewart (87) in a 1933 report cites results in 257 cases of intraoral cancer treated at the Steiner Clinic by various methods. His results are stated as follows: lip, 70 per cent; cheek, 11 per cent; tongue, 7 per cent; floor of mouth, 20 per cent; tonsil, 35 per cent. All of the cases were not observed for five years.

Taylor (92) in 1942 in an evaluation of regional lymph-node dissection gave some interesting figures on the results obtained from neck dissection in cases with definitely involved lymph nodes. The report fails to state the period of time of the "cures." The percentages, however, show the variation of results from different primary sites. He reports 33 per cent cure from neck dissection when the primary site was skin tumors, 18 per cent from melanoma, 58 per cent from lip, 43 per cent from tongue, and 42 per cent from other parts of the mouth. His paper excluded untraceable cases, patients dying of intercurrent diseases, and cases in which there was failure in controlling the primary carcinoma. This indicates the many variable factors to be considered in interpreting results.

Duffy (20) reports in 1941 that he treated 68 patients with operable neck metastases from intraoral carcinoma with irradiation and that in this group there was a five-year survival rate of 7.4 per cent. In 45 operable cases in which neck dissection was done the five-year survival rate was 20 per cent. He stated in an earlier report, "although metastatic carcinoma of the neck can be cured by irradiation, as shown by the figures, the relative percentages of the irradiated and the operated cases in the operable group leave no doubt as to the method to be employed" (19).

Cervical-node carcinoma secondary to lip malignancy. The best results of therapy of carcinomatous cervical nodes are usually reported in cases in which the primary lesion is located on the lip. Fischel (29) states in 1934 that from his experience, one may expect 55 per cent five-year cures in lip cases with operable carcinomatous nodes and 75 per cent five-year cures in lip carcinoma with only hyperplastic nodes. As pointed out, the definition of "operable cervical nodes" is subject to a wide difference in interpretation. Wile and Hand (98) in a study of 425 cases of carcinoma of the lip in 1937 report 40 per cent five-year cures from suprahyoid dissections in those cases showing positive carcinoma of the cervical nodes. Newell (70) in a study of 390 cases of carcinoma of the lip in 1939 gives the following results on five-year cures:

TABLE VII.—HISTOLOGICALLY PROVED CASES OF CERVICAL METASTATIC CANCER TREATED BY RADIATION ALONE

(Free of Disease March 1, 1939)

Five Years or More		Less than Five Years	
Prior to 1930	4	1935	12
1930	5	1936	13
1931	5	1937	19
1932	12		
1933	10		
1934	10		
Total	46	Total	44

(From Martin, H. E. *Ann. Surg.*, 1941, 114: 984.)

	Number	Per cent
Excision of tumor only (no metastases clinically)	176	80.9
Excision of tumor and neck dissection (no metastases found)	90	85.3
Radical excision and neck dissection (metastases present)	83	22.5
Hopeless cases	24	

Kennedy (44) reports in 1941 that of 54 patients with cancer of the lower lip with proved metastatic involvement in the nodes of the neck, 14 (26 per cent) had their disease clinically arrested over five years. All of these patients were treated by neck dissection since June, 1924. Figi (26) in 1934 reports 39 per cent five-year arrests of the disease when lymph-node involvement was found and neck dissection done. Lehmann (46) in 1941 reports that of 39 patients with cancer of the lip treated by surgery and lymph-node dissection when any suspicion of involvement was present, 54.5 per cent were free of symptoms for five years. Howes and La Rosa (34) in an interval statistical study of the end-results in all cases of lower-lip cancer treated at the Brooklyn Cancer Institute from 1930 to 1939, inclusive, report that of 6 cases admitted with palpable nodes the only one cured underwent a radical dissection. Of 14 cases which developed evidence of extension following the original therapy only 4 were cured; 1, by treatment of the metastatic area with interstitial radon (a total of 30 millicuries-destroyed was given to an area 2 cm. in diameter); the other 3 were treated by surgical

dissection. The cases that were not controlled were treated by external irradiation or interstitial radium applied to the metastatic area. C. L. Martin (51) in 1941 cites relatively poor results from surgery. He reports 26 of 50 cases apparently cancer free from one to seven years. He uses radium needle inserts and then external radiation. Most of the cases, however, were not biopsied.

Cervical-node carcinoma secondary to carcinoma of the tongue. In 1936, Searby (84) stated that in the majority of cases of carcinoma of the tongue, death is indirectly the result of metastases to the cervical glands and that a cure will depend on the extent of the metastases.

In 1935, New (67) reported on 162 cases of carcinoma of the tongue with node involvement as follows:

	Number	Five-Year Survivals
Nodes negative, but dissected.....	59	29
Nodes negative, not dissected.....	40	19
Nodes positive, and dissected.....	57	8

Morrow (66) in 1937 reported a study of carcinoma of the tongue at the New York Post Graduate Hospital. The study emphasized the decreased risk afforded by performing the operation on the tongue and cervical nodes at separate times. Twenty per cent of all patients treated surgically survived five years or more; 32 per cent of those without node involvement and 11 per cent of those with node involvement were reported as cured for five years.

Cervical-node carcinoma secondary to carcinoma of the mouth. Mekie (63) reporting in 1932 on the results of treatment of cases of buccal carcinoma with glandular metastases cites the following discouraging results obtained by Forssell, Quick, and Mekie.

Author	Total cases	Cases with glandular metastases			
		Number	Number cured	Per cent cured	Method
Forssell	244	72	0	0	Radium
Quick	453	161	6	3.7	X-ray therapy
Mekie	105	53	2	3.8	Chiefly operative

(From Mekie, D. E. C. *Am. J. Cancer*, 1932, 16: 1006.)

Fraser (33) reports in 1934 on 68 cases of oral carcinoma. Twenty-three per cent of those without node involvement were reported as cured after two years. Only 3.8 per cent of the cases with cervical-node involvement were well for two years. In this group the primary lesion was treated with radium and the cervical nodes were extirpated surgically when involvement was found.

H. Martin and Sugarbaker (61) in 1940, in a report on treatment of carcinoma of the floor of the mouth, state that in the average favorable case of metastases following complete healing of the primary lesion it is probable that radiation is at least as successful as neck dissection. They cite 6 cases of patients with cervical metastases treated by radiation who were well for five years. To report these radiation cures by percentage would be of little value as all "hopeless" cases were treated with x-rays. Eight patients with proved cervical metastases were subjected to neck dissection. Four remained well. Neck dissection is usually not suitable for treatment of the cervical metastases when the primary lesion is in the floor of the mouth, because if the lesion is extensive, a long period is required to get it under control, or if the cervical metastases are early and the lesion small, dissection cannot well be done simultaneously with extensive irradiation in the mouth. Fischel (29) in 1934 reports 13.6 per cent of cures in mouth cancer with cervical metastases, the nodes having been treated by radical surgery. Taylor (93) in 1934 reports 21 per cent of five-year cures in 19 patients with carcinoma of the buccal mucosa with nodes involved after treatment by radical operation.

Cervical-node carcinoma secondary to palate malignancy. New and Hallberg (69) in discussing the results of treatment of patients with malignant tumors of the palate state that 9 patients with palpable nodes had dissection in addition to treatment of the local lesion. They all showed involvement microscopically. Of these, 6 returned later to the clinic for examination and lived on an average of five and one-half years after the initial treatment.

H. Martin (55) in a 1942 report on palatal tumors stated that he found the cure rate of malignant tumors when metastases were present on admission was 6 per cent. This is 2 per cent lower than his cure rate of cancer of the tongue. The low rate is influenced by the fact that the group includes patients admitted in the advanced stages of the disease. The group of cases reported which developed metastases after admission had a cure rate of 8 per cent. In those patients in whom metastases do not occur at any time during the course of the disease, the chance of cure is 50 per cent. In 18 patients with bilateral metastases there was 1 cure, or 5 per cent.

Martin discusses the methods of treatment in detail and follows the same procedure as he advocates for the other forms of intraoral cancer, that is, treatment to the neck only if and when there is evidence of metastases. If there is pal-

pable involvement of the cervical lymph nodes by epidermoid carcinoma on admission, the treatment in most cases is by irradiation—fractionated roentgen radiation through small portals to the individual nodes, supplemented by the implantation of radon seeds. Radiological, rather than surgical, treatment in these cases is indicated if metastases are present on admission as the growth in the palate is almost invariably far advanced and suitable only to treatment by aggressive irradiation. If metastases from epidermoid carcinoma of the palate occur at an interval after control of the primary lesion, Martin advocates using either irradiation or neck dissection, the choice depending on whether the metastatic nodes are unilateral or bilateral. Irradiation is preferable when late metastases are bilateral or when the primary lesion is in the midline. Neck dissection is considered preferable for late unilateral and homolateral metastases from a primary lesion not involving the midline. For cervical metastases from adenocarcinoma of the palate, which is always radioresistant, neck dissection is preferable. When these metastatic nodes are multiple or large, the heavy cancer-lethal dose of radiation would have to be given over such a large volume of the neck as to be dangerous. In small nodes (1 to 1.5 cm. in diameter) cancer lethal radiation can, Martin states, be given without any particular difficulty by using a combination of external irradiation and a heavy dose of radon seeds.

Cervical-node carcinoma secondary to carcinoma of the nasopharynx. Anaplastic transitional-cell tumors of the nasopharynx are known to metastasize early to the regional cervical lymph nodes. Irradiation has been used in the treatment of these tumors in most instances because of their response to this form of therapy and since their location renders treatment by surgery impractical. While studies in the literature discuss treatment of these tumors, results are not interpreted in terms of metastatic lymph-node therapy alone (35, 1, 80, 15, 34).

Cervical-node carcinoma secondary to carcinoma of the tonsil. H. Martin and Sugarbaker (60) report in 1941 on a series of 157 unselected consecutive cases of cancer of the tonsil seen at the Memorial Hospital during the years from 1931 to 1935. The cure rate was 40 per cent when there were no metastases present on admission or none occurred at any time. When metastases were present on admission (75 per cent of this series) the cure rate was 8 per cent.

Most papers regarding carcinoma of the tonsil do not make a distinction between cures of patients treated for the primary lesion alone and those treated for cervical metastases. Also, the series were not designated as unselected (13, 73, 62).

COMMENTS

After a careful consideration of the evidence given in the literature regarding the treatment of metastatic cervical cancer, the following principles seem especially important in the management of this condition. The primary lesion must be controlled or at least there must be reasonable evidence that it may be controlled before one is justified in adopting radical procedures in the management of regional nodes. The decision as to whether or not to subject the patient to a prophylactic node dissection must be decided in each individual case. Factors to be considered in the decision are location, size, extent, duration, and histological structure of the primary lesion, the general condition of the patient, and the experience of the surgeon. It is especially important to determine whether or not the patient can be given adequate follow-up care, for if he is not able to return for frequent follow-up visits, then the prophylactic dissection is far more important.

In treating unilateral movable cervical lymph nodes involved by carcinoma surgery is usually the method of choice. The dissection in such instances must be radical and the tissue removed as a block. In some instances, larger fixed nodes may be shrunk and rendered operable by suitable preoperative irradiation. In other instances where all the carcinoma tissue is removed from the neck except a small bit of fixed tissue, radon or radium may be implanted into the mass of carcinoma left adherent to a vital structure and some chances of cure obtained.

Convincing evidence concerning the value of prophylactic irradiation is lacking. Irradiation is often of value in offering palliation in far advanced cases.

It is not safe to give external irradiation to the entire neck in sufficient amounts to be carcinomacidal. In cases in which the cervical metastases are limited to one or two localized nodes, larger doses of external irradiation may be safely concentrated on these areas by means of very small portals and some cures may be anticipated. A combination of interstitial and external irradiation, expertly used, may also in certain instances permit the use of carcinomacidal doses without too great destruction of normal tissue. It is very apparent that surgery and irradiation should be considered complementary rather then competitive methods in the management of metastatic cervical-node cancer.

Results obtained in treating carcinoma of the cervical nodes are always likely to vary with the origin of the malignant process since some primary sites tend to give rise to more widespread metastases than others.

SUMMARY

1. The literature from 1932 through 1941 concerning results of treatment of metastatic carcinoma of cervical lymph nodes is reviewed.

2. Controversial arguments for and against prophylactic treatment of nodes of potential involvement are presented.

3. The methods of treatment reviewed include surgery, x-radiation, radium radiation, and combinations of the three.

4. The difficulty of comparing results reported by various authors is stressed.

5. Results are presented in terms of the group as a whole and also in relation to specific sites of origin.

6. This review emphasizes the necessity of individualization in the treatment of metastatic cervical cancer. Among the important factors to be considered are: location of the primary tumor; size, extent, duration, and histological structure of the neoplasm; the general condition of the patient; and, lastly, the professional experience and equipment available for therapy.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Logsdon, C. M.: The Utilization of Vitallium Appliances to Treat Edentulous Mandible Fractures. *J. Am. Dent. Ass.*, 1942, 29: 970.

The treatment of fracture of the edentulous mandible is facilitated by the use of a vitallium appliance. This consists of screw posts 3 mm. in diameter and 3 cm. in length. They are inserted by making a small incision, drilling a hole 1.25 cm. in depth into the alveolar process, and placing the posts at right angles to the long axis of the mandible. A sleeve fits over the exposed portion of the post and holes through the sleeve and post. An alignment bar (14 gauge) is inserted through the sleeves connecting the posts, bent at the ends, and wired to the posts, as the fractured parts are manipulated into proper position. Some pressure necrosis occurs about the posts, but fixation is satisfactory and after union the screws are removed.

Five successful cases with an average fixation time of six weeks are reported.

CHARLES W. FREEMAN, D.D.S.

EYE

Savin, L. H.: A Note on 2 Cases of Megalocornea. *Brit. J. Ophth.*, 1942, 26: 265.

A study of more than 80 cases of megalocornea reported in the literature reveals that cataract is a fairly common complication. According to Veil and Sarrazin its occurrence is invariable by the time the patients reach the age between forty and fifty years, the type of cataract being extremely variable. There is considerable tendency toward loss of vitreous during the extraction of these cataracts, and other complications such as retinal detachment and severe iritis have been reported.

Fig. 1. Showing size of grandson's left eye compared to face.

The author reports successful removal of the cataractous lenses in a man aged fifty-eight with megalocornea. Both corneas measured 14 mm. in the horizontal meridian. There were no folds or splits in Descemet's membrane. The irises were somewhat atrophic and the pupils were a vertical oval. The anterior chambers were very deep and the intraocular tension was normal. Both lenses showed cuneiform cortical opacities and vision was reduced to hand movements, with faulty light projection in the right eye. There were no complications following the operation on either eye, the extraction being performed within the capsule with the Arruga forceps, and with a complete iridectomy. There was discovered postoperatively an area of chorioidal atrophy with some secondary optic atrophy in the right eye, which explained the poor projection, so that very little visual improvement was obtained in this eye, as had been anticipated. The visual acuity of the left eye with correction was 6/9.

Investigation of the family history in this case revealed that the grandson also suffered from megalocornea. Unlike the pupils of the grandfather those of the grandson were circular; an arcus senilis was present, which was also noted in the older patient. The fundi and lenses of the grandson were normal, however, and visual acuity was 6/9. Neither the grandfather nor the grandson showed any mental impairment. The boy's mother was normal, but there was a history of an uncle of the older patient with a similar condition. It will be noted that all 3 cases of megalocornea occurred in males; the patient's mother and one of his daughters were "paralyzed from the knees down." There was no history of consanguinity.

WILLIAM A. MANN, M.D.

Horner, W. D.: Dinitrophenol and Its Relation to the Formation of Cataract. *Arch. Ophth.*, Chic., 1942, 27: 1097.

Horner discusses the administration of dinitrophenol for the rapid reduction of body weight and its relation to the formation of cataract. Dinitrophenol is a yellow solid which has a faint odor of phenol. For the treatment of obesity the sodium salt, $C_6 H_3 (NO_2)_2 ONa \cdot H_2O$, is usually administered. Months or years may elapse between the time of the last dose of dinitrophenol and the onset of blurred vision as a result of anterior subcapsular and posterior subcapsular lens changes. The most

marked change—a dense saucer-shaped, granular deposit with a golden or silvery luster—occurs in the subcapsular region of the posterior part of the lens. Treatment of obesity with dinitrophenol has resulted in affections of the skin and the blood, the development of cataracts, and in several fatalities. After the use of dinitrophenol or dinitro-orthocresol, 0.86 per cent of the patients developed bilateral cataracts usually within a year after administration of the drug. Visual acuity was usually restored after cataract extraction. Nine deaths from the use of dinitrophenol and 1 from dinitro-orthocresol have been reported.

Horner concludes that the administration of dinitrophenol is contraindicated for the reduction of excess body fat because of the danger of the formation of cataract. JOSHUA ZUCKERMAN, M.D.

Bothman, L., and Blankstein, S. S.: The Eye in Adrenal Sympathicoblastoma (Neuroblastoma); Importance of Ocular Findings, with the First Pathological Report of a Metastatic Tumor in the Chorioid. *Arch. Ophth.*, 1942, 27: 746.

Adrenal sympathicoblastoma, or neuroblastoma, as it is commonly called, is a malignant tumor occurring almost exclusively in infants and children. It occurs only rarely in adults. The typical cell is an embryonal nerve cell derived from neural ectoderm, and is the primary sympathetic cell.

Four cases of adrenal sympathicoblastoma observed in 1936 and 1937, in which there was striking similarity in the ocular complications, prompted this report. These cases illustrate the value of ocular signs for the diagnosis of adrenal sympathicoblastoma.

The classification of the tumor into a Hutchison type and a Pepper type dates from the classic reports of these authors. The classification is only clinical, not pathological. When the major metastases are local and involve only the lower and periaortic lymph nodes the tumor is known as the Pepper type. When the metastases are in the orbit, skull, meninges, and long bones, and the ocular signs occur early it is known as the Hutchison type. A third or mixed type also occurs. In this there is some involvement of the liver and bone marrow but the skull is usually free from metastases.

The authors summarize their findings as follows:

Four cases of adrenal sympathicoblastoma with ocular manifestations are reported. Ecchymosis of the eyelids was the most constant finding, as it occurred in all 4 cases; papilledema occurred in 2; exophthalmos in 1; a temporal tumor in 1; and paralysis of the external rectus muscles in 1.

The importance of ecchymosis and exophthalmos as distinct aids to the diagnosis is stressed, since biopsy often fails to provide the correct diagnosis.

The overlapping of the Pepper and the Hutchison type is well illustrated by the cases reported, all of which were of the Hutchison type.

This tumor metastasizes to the globe via the blood stream, as demonstrated by the presence of typical tumor cells in the medium-sized blood vessels of the chorioid and the choriocapillaris in 1 of these cases. LESLIE L. MCCOY, M.D.

Fig. 1

EAR

Shambaugh, G. E., Jr.: Otosclerosis; Results with the Fenestration Operation. *J. Am. M. Ass.*, 1942, 119: 243.

Shambaugh states that the fenestration operation offers the possibility of partial restoration of impaired hearing, the result of stapes fixation.

The problem of the closure of the new window has been largely solved by the technique now used.

Hearing after a successful fenestration operation usually surpasses that secured with hearing aids.

The fenestration operation is not always successful, and the hearing may be made worse in the ear that has undergone operation. For this reason the poorer hearing ear should be selected for operation.

A hearing improvement maintained for more than six months after fenestration may be regarded as probably permanent.

Properly done, the fenestration operation carries little risk to life, health, or useful hearing.

Because of the proper selection of cases and improvements in technique, 88.9 per cent of the 117 patients operated on during a period of three and one-half years now have a significant improvement in hearing. JAMES C. BRASWELL, M.D.

Lindsay, J. R.: Thrombosis of Intracranial Venous Sinuses in Middle-Ear Suppuration. *Illinois M. J.*, 1942, 81: 467.

This report is directed chiefly to two phases of the problem of thrombosis of intracranial venous sinuses in middle-ear suppuration, which have come into prominence in recent years, and their influence on the management of this complication, namely, the association of sinus thrombosis with petrous-pyramid suppuration, and the relative place of chemotherapy and surgery in the treatment.

The report is based upon 25 consecutive cases.

Certain fundamental points regarding the care of this condition may be emphasized:

1. This type of complication, whether it is already existent or only impending, constitutes an urgent situation.

2. The first step in treatment should be chemotherapy. Recent experience favors sulfathiazole as the therapeutic agent of choice. An adequate concentration of the drug should be obtained as soon as possible. This relieves the urgency for surgical interference.

3. The second stage, and the most essential part of the treatment, is adequate surgery. Extension of the suppuration can be temporarily prevented by the use of the drug, but in the majority of cases adequate surgical drainage is essential in order to obtain a cure.

4. The surgical treatment should accomplish two objectives in order to be adequate: the removal or adequate drainage of the focus of suppuration within the bone, and adequate drainage or removal of the suppurating thrombus within the venous channels.

The surgery should be carried out before other intracranial complications have developed either from the suppurating thrombus or directly from the focus within the bone. Otherwise the intracranial complications will have to be dealt with in a manner suitable for the particular complication present.

5. Five cases, or 20 per cent of the group, occurred secondarily to petrous-apex suppuration. In such cases drainage of the suppurating focus of the apex is essential to prevent further complications, although the sinus thrombosis may have been arrested.

6. It seems probable that adequate chemotherapy if given in all cases of severe middle-ear suppuration at the onset of the disease will prevent the development of complications of this type. However, when the disease has progressed to the point of necrosis and breakdown in the cell system or suppuration within a thrombosed venous sinus chemotherapy alone will not eradicate the disease.

JOHN F. DELPH, M.D.

Lindsay, J. R.: Labyrinthine Dropsy and Ménière's Disease. *Arch. Otolar.*, Chic., 1942, 35: 853.

The pathological changes in the inner ear in a case of idiopathic bilateral labyrinthine dropsy (hydrops labyrinthi) with severe deafness is described by Lindsay. From the cases reported to date the evidence indicates that labyrinthine dropsy of this type constitutes a pathological entity which may produce either auditory disturbances alone or the clinical syndrome known as Ménière's disease. The histopathological changes in this case provide evidence to explain the interference with function in this disease. The functional disturbances cannot be explained on the basis of increased endolymphatic pressure because of the existing mechanism to preserve equilibrium with the perilymph and cerebrospinal fluid.

The auditory disturbances characteristic of this disease appear to be most adequately explained on a mechanical or physical basis. The distortion of the saccule and Reissner's membrane and the resulting disproportion of the scala media and the scala vestibuli, along with a relatively well preserved nerve apparatus, suggest an interference with sound transmission in the column of fluid in the cochlea as the cause of disturbed function. The disturbance of vestibular function and the attacks of vertigo are explained on a physical basis by the occurrence of herniations from the utricle, which invade the canals and produce distortion of the walls of the ampullae. Distortion of an ampulla interferes with normal function of the cupula ampullaris and explains both the attack of vertigo and the depression of caloric excitability in the later stages. The histopathological picture explains the favorable effect of certain types of treatment but fails to permit any conclusion as to the pathogenesis. Neither has clinical observation provided any definite indication of the etiological factors in this type of disease of the inner ear. NOAH D. FABRICANT, M.D.

Woodruff, G. H., and Henner, R.: Endaural Mastoidectomy. Experience in a Series of 76 Cases. *Arch. Otolar.*, Chic., 1942, 35: 777.

This report covers 76 cases of endaural surgery of the mastoid, 29 of which were simple mastoidectomies, 41 mastoidotympanectomies, and 5 atticomastoidectomies, and 1 was fenestration of the labyrinth.

The Lempert technique for endaural approach to the mastoid was used in all cases, and the authors present for the first time 5 cases of atticomastoidectomy with an endaural approach.

Certain advantages and conclusions are reached, some of which follow:

Routine postoperative inspection of the mastoid wound cavity may be done by merely retracting the edges of the wound with a nasal speculum. There are no stitches to be removed.

Packing is unnecessary in the endaural operation.

The postoperative care is more simple than that following the postauricular operation.

Pain and stiffness of the neck from injury to the attachment of the sternocleidomastoid muscle occur less frequently with this method than with the postauricular method.

It is impossible for a retroauricular fistula to form after the endaural operation.

The cosmetic result is of secondary importance, but in general the endaural method gives a decidedly better result than the postauricular one.

The main disadvantage of the endaural approach for complete mastoidectomy is the necessity of performing the mastoid exenteration through a relatively small opening. JOHN F. DELPH, M.D.

NOSE AND SINUSES

Rosenvold, L. K.: Estrogenic Implants in the Treatment of Atrophic Rhinitis. *Arch. Otolar.*, Chic., 1942, 35: 883.

To Rosenvold's knowledge the treatment of atrophic rhinitis by the subcutaneous implantation of estrogens is reported for the first time. Implantation of large unit doses of estrogenic substances appears to exert a beneficial effect in atrophic rhinitis. Of 20 female patients, 13 were definitely benefited. Four experienced only mild improvement in their condition or were observed for such a short time that improvement could not be proved beyond a doubt. In 3 patients the condition was not improved or was aggravated. One of 4 male patients displayed marked improvement which lasted for eight months. Another experienced mild temporary improvement. The other 2 were not benefited.

Generally speaking, the patients who were benefited noted less dryness and crusting, sometimes more fluidity of secretions, sometimes less secretion, often fewer headaches, and a general feeling of improvement. At least 2 patients who had experienced trouble in gaining weight noted increases in their weight. Some who had had the disease for many years felt subjectively well. Objectively, less crusting was noted, and the nasal mucosa was observed to have changed from a dull, dry stage to a more moist and glistening appearance. Clinical improvement seems to last from four months to two years.

In this series the author tried to use only the single treatment, namely implantation, unless the patient had already used irrigation or other therapeutic aids. However, except in a carefully controlled research series, nasal irrigation and even the use of local nasal estrogenic applications might be advisable as additional treatment. Fifty-four per cent of the patients in this series were Mexicans. Mexican patients constitute less than 10 per cent of new admissions at the White Memorial Clinic. Whether this indicates the influence of racial, economic, or social factors is not clear. NOAH D. FABRICANT, M.D.

Shannon, W. R.: Nasal Sinusitis and Orthostatic Albuminuria in Childhood. *Minnesota M.*, 1942, 25: 458.

The author states that orthostatic albuminuria in children is a frequent accompaniment and apparently a result of nasal sinusitis, especially of a subacute or chronic type. Such being the case it is contended that orthostatic albuminuria must be viewed with much more concern than has been the custom in the past. JAMES C. BRASWELL, M.D.

Peele, J. C., and LeJeune, F. E.: A Clinical Survey of the Sphenoid Sinus, with Special Reference to the Direct Method of Lavage and Injection of Opaque Medium. *Laryngoscope*, 1942, 52: 423.

During 1940 and 1941 Peele and LeJeune lavaged and injected the sphenoid sinus with opaque medium by the direct method in a total of 97 patients. The studies of 75 of these cases were sufficiently complete to be included in this report. In the authors' experience the direct method of lavaging and injecting the sphenoid for diagnostic purposes was highly satisfactory. The authors believe that some cases of retrobulbar neuritis may be of sphenoidal origin, and that sphenopalatine neuralgia, when of sphenoidal origin, may be due to involvement of either the vidian or maxillary nerve.

Signs due to sphenoiditis may be reflected in both the upper and lower respiratory tree. Many cases of chronic catarrhal otitis media and some cases of chronic suppurative otitis media are unquestionably due to a diseased sphenoid. Edema of the posterior tip of the inferior turbinate with a congested state in the posterior fourth of the lateral nasal wall may indicate sphenoid pathology in some cases. Disturbances in color acuity and contraction of the visual fields were seen in the hyperplastic type of sphenoiditis. The differential diagnosis included such conditions as neurosis, brain tumor, migraine, tic douloureux, syphilis, and epilepsy.

The authors propose a plan of therapy for selected cases of suppurative sphenoiditis consisting of direct lavage of the sinus followed by periodic instillations of an opaque oil by the displacement method. They are convinced of the temporary mild therapeutic value of the halogenated oils.

Sphenoiditis in children is probably far more common than is generally realized. In several children in whom its presence was proved the symptoms were mainly those of frontal headaches, head colds, malaise, poor appetite, and fever. One child, aged twelve years, who had had an allergic diathesis since childhood, revealed a hyperplasia of the sphenoid mucous membrane. NOAH D. FABRICANT, M.D.

Marks, R. F.: Sulfathiazole in the Treatment of Sinusitis. *Arch. Otolar.*, Chic., 1942, 35: 794.

This report covers a complete review of the literature on the use of sulfanilamide and its derivatives in the treatment of sinusitis, and a report on 10 cases treated by the author's method.

The method finally adopted was the use of from 20 to 50 per cent concentrations of sulfathiazole in a lubricating jelly base. This mixture was injected into the antra in quantities of 4 cc. about two or three times per week, as required.

Cultures were made from antral washings and the results showed staphylococcus aureus or albus in all except 2 cases.

The average duration of symptoms was ten months and the average time required for resolution was three or four weeks. Treatment was effective in 70 per cent of the cases. JOHN F. DELPH, M.D.

Fig. 1

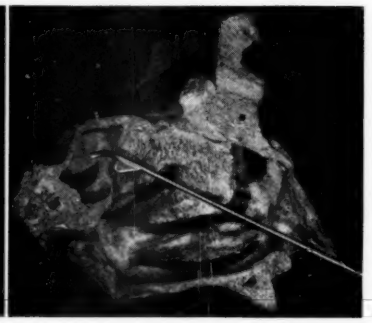


Fig. 2

Tremble, G. E.: The Sphenoid Sinus. A Safe and Simple Method of Irrigation. *Arch. Otolar*, Chic., 1942, 35: 755.

Tremble describes in some detail a method of opening and irrigating the sphenoid sinus. The method is simplified by two instruments which he has found very useful. JAMES C. BRASWELL, M.D.

MOUTH

Steggerda, M., and Hill, T. J.: Eruption Time of Teeth Among Whites, Negroes, and Indians. *Am. J. Orthodont.*, 1942, 28: 361.

Because the importance of the eruption time of the teeth as a measure of maturity, and the separation of the dental age from the chronological age, are of considerable interest to the anthropologist and the orthodontist, the authors made a careful study of the influence of race upon the mean time of tooth eruption in the mandible and maxilla, including a comparison of sexes and the order of eruption.

The four races studied embraced groups living in entirely different surroundings, comprising Whites, Negroes, Navajos, and Maya, and all ages were carefully recorded. Rather extensive charts were prepared showing the mean eruption time of the teeth of males and females.

Among the most important results of the study were the racial differences existing in eruption time in this order: Navajo, Negro, Maya, and White; the sex differences which were most marked in the canine teeth; and the fact that although the order of eruption proved to be the same in all races under observation, there was a difference in the maxilla and mandible and in the sexes.

WILLIAM G. SKILLEN, D.D.S.

Hirschfeld, I.: The Treatment of Vincent's Infection of the Mouth. *J. Am. Dent. Ass.*, 1942, 29: 1150.

This article discusses many of the controversial points pertaining to the treatment of Vincent's infection in an attempt to clarify and, if possible, reconcile them.

The points that the author has covered are the value of bacteriological diagnosis, the care and judgment to be exercised in subgingival intrumentation, the dangers accompanying surgical procedures, such as the extraction of teeth, and the injurious potentialities of sodium perborate.

A number of clinical observations are recorded, as well as the results of certain experiments which were undertaken.

Although, as the author admits, the consideration of additional controversial topics is desirable, the discussion, as far as it goes, should prove enlightening and helpful to those engaged in the treatment of this disease. WILLIAM G. SKILLEN, D.D.S

PHARYNX

Peele, J. C., Kimata, H., Allen, K., and Hallaron, J.: Giant Lymph-Follicle Hyperplasia of the Nasopharynx. A Review of the Literature and Report of a Case. *Arch. Otolar.*, Chic., 1942, 35: 572.

In an attempt to determine some of the more significant features of giant lymph-follicle hyperplasia the authors have reviewed the literature on the subject and have reported a case recently encountered by them in which the pathological manifestations were strictly limited to the nasopharynx. This case and that first reported by Novak constitute apparently the only 2 cases of the nature reported in the literature.

The question of prognosis is paramount with the patient. So far as the authors have been able to determine there are no clinical or pathological criteria whereby one is enabled to prognosticate the future course of a tumor definitely diagnosed as purely giant lymph-follicle hyperplasia. If one accepts past experience as a guide, then one may say that such a tumor stands a reasonably good chance of progressing to a fatal issue within the relatively brief period of a few years.

The relative immunity of the lymphoid tissue of the pharynx to the ravages of this disease is unique and a point of special interest. The presence of markedly hypertrophied tonsils and adenoids in

children is a matter of everyday routine observation for many physicians. The presence of adenoid tissue in the vault of the nasopharynx of an adult is not unusual. When, however, nasopharyngeal growths of lymphoid tissue assume tumor proportions in an adult, the necessity for immediate detailed clinicopathological investigation is of great importance. NOAH D. FABRICANT, M.D.

Taffel, M., and Harvey, S. C.: Ludwig's Angina. *Surgery*, 1942, 11: 841.

In their discussion of Ludwig's angina the authors include only those infectious processes located in the areas between the mylohyoid and the geniohyoid, or between the geniohyoid and the genioglossus muscles, regardless of the etiology, the point of origin, or the pathways of spread of that infection. They state that an infectious process, whether associated with suppuration or with edema alone, will increase the tension within the submandibular space and will displace the only yielding bordering structures, namely, the floor of the mouth, the tongue, and the pharynx. It is this displacement which is in a large measure responsible for the respiratory difficulty so characteristic of the disease. Because of its close proximity to the site of infection and because also of adjacent venous obstruction the larynx itself may suddenly be involved in a rapidly progressive edema and become completely obstructed.

Since the infection lies deep to the mylohyoid muscle and the deep cervical fascia, the skin of the neck in the submandibular and submaxillary areas will not be involved early in the disease and will slide freely over the underlying swollen and indurated tissues. Similarly, fluctuation is not an early sign and is almost invariably absent in the initial stages of the illness. Often no pus is present and the local distortion of the tissues is caused only by edema associated with the cellulitis. The authors' criteria for making the diagnosis of Ludwig's angina are (1) a deep and tender swelling in the submaxillary and submandibular areas of the neck; (2) swelling of the floor of the mouth; and (3) elevation of the tongue.

The authors favor operation immediately after the diagnosis of Ludwig's angina is established. The primary object of operation is not to drain pus but to decompress the submandibular space and to release the tension within it as completely and as early as possible. This can be accomplished with certainty by transverse section of the deep cervical fascia and the mylohyoid muscle on one or both sides according to whether the infection is unilateral or bilateral. Local anesthesia is the anesthetic of choice, other types of anesthesia being contraindicated. The skin incision (Fig. 1) is beneath and parallel to the horizontal ramus of the mandible. The incision is deepened to include the deep fascia, the anterior belly of the digastric muscle, and the mylohyoid muscle, all of which are divided transversely and completely. If it is suspected that the infection lies above the geniohyoid muscle that muscle is divided also. The floor of the submandibular space is laid

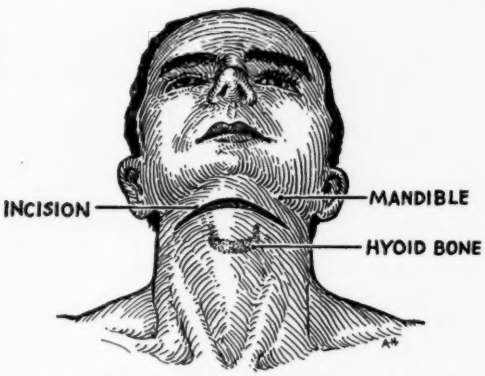


Fig. 1. Diagrammatic sketch showing site of operative incision.

open and the tension within it is fully released. The division of the fibers of the mylohyoid muscle should be thorough and total, regardless of whether actual pus or edema is present. This muscle should be transected even when pus is encountered immediately under the skin and platysma. Sulfonamides may and should be used as adjuncts to the treatment, but nothing should replace immediate surgical decompression of the submandibular space.

The authors report 2 deaths among 45 patients with Ludwig's angina treated by immediate and adequate surgery; one patient died from a ruptured dissecting aortic aneurysm, the other from a concomitant suppurative cavernous sinus thrombophlebitis, lung abscess, and pneumonia.

EARL O. LATIMER, M.D.

Zerffi, W. A. C.: Tonsillectomy and Its Effect on the Singing Voice. *Arch. Otolar.*, Chic., 1942, 35: 915.

The question as to whether the singing voice is beneficially or adversely affected by removal of the faucial tonsils is of grave importance to singers. A singer whose tonsils are in such an infected condition as to be a menace to his general health, yet whose livelihood depends on his voice is faced with a decision which may well give him cause for worry.

Unfortunately, the function of the soft palate in voice production is rarely understood by vocal teachers, and the same can be said, though in lesser degree, of laryngologists.

According to Hudson Makuen, the soft palate has two important functions in voice production: (1) its valvular function in influencing vocal resonance, and (2) its power of tilting the thyroid cartilages, which stretches the vocal cords and in this way influences the quality and the pitch of the voice. Two muscles of the utmost importance to the voice lie behind the tonsils, the palatopharyngeus and the stylopharyngeus. These two muscles are attached to the rear of the thyroid cartilage, and it is their action which tilts the cartilage and helps to tense the vocal cords.

Any injury to these muscles is disastrous to the production of the voice, since it destroys the higher tones.

This seeming paradox, however, can be explained by recognition of the fact that some temporary impairment of the palatal muscles after tonsillectomy is unavoidable. However, it cannot be too strongly emphasized that this impairment need be only temporary and can be eliminated in a relatively short time provided correct vocal exercises are employed. No matter how carefully and efficiently the operation is performed a certain amount of scar tissue forms and some stiffness in the action of the palatal muscles must be expected.

The conclusion is unavoidable that accurate knowledge of the action of the palatal muscles is of inestimable advantage both to singers and to laryngologists. JOHN F. DELPH, M.D.

NECK

Hendrick, J. W.: The Use and Abuse of Iodine in the Management of Goiter. *Am. J. Surg.*, 1942, 56: 455.

This is an article of clinical opinion with extensive quotations from the literature. The results of a questionnaire sent to the members of the American Association for the Study of Goiter are reported. No indication as to whether the replies were from surgeons or internists is given. Almost 90 per cent of the patients treated by goiter surgeons have had previous iodine medication by some one else; thus they have passed the primary iodine remission which allows the lowest surgical mortality. "Practically all postoperative thyroid crises occur in patients who have had long continued iodine medication before consulting the goiter surgeon." PAUL STARR, M.D.

Guptill, P.: Acute Iodism During the Treatment of Toxic Goiter. *Surgery*, 1942, 11: 962.

The author presents a case report of acute iodism occurring during the treatment of toxic goiter. He was able to find 7 other cases in the literature.

The patient, a forty-year-old man, had an acute thyrotoxicosis with a basal metabolic rate of plus 36. He was given 1 cc. of Lugol's solution orally 3 times daily, along with 1 cc. of sodium iodide in 500 cc. of a 5 per cent glucose solution given intravenously. After five days he complained of sore throat, and he had coryza and a conjunctivitis the following day. There was profuse sweating and his temperature reached 103.2° F. The patient's condition became alarming. There was generalized itching and a macular rash on a large part of the body.

All iodine medication was stopped, morphine was given for rest, and fluids were administered parenterally. The temperature returned to practically normal eight hours after cessation of the iodine medication. The basal metabolic rate taken during the acute iodism was plus 20. A two-stage thyroidectomy was performed on the thirteenth and twenieth days of hospitalization.

The author concludes that if a patient is sensitive to iodine administered orally the symptoms occur early, and they progress if the drug is continued. The continued use of iodine in cases in which there has been a febrile response is dangerous. However, the basal metabolic rate is affected normally by iodine in persons showing a febrile response.

EARL O. LATIMER, M.D.

THE SURGICAL TREATMENT OF HYPERTENSION

Collective Review

KEITH S. GRIMSON, M.D., F.A.C.S., Durham, North Carolina

EDITORIAL NOTE: A review entitled "The Surgical Treatment of Hypertension," by John Martin, M.D., was published in Volume 67, page 419, 1938. Because of sustained interest and rapid advances in this field, the following review covering the work published since the above date is presented.

THE last decade has contributed much information toward an understanding of the etiology of clinical hypertension of the so-called "essential hypertension" type, and an evaluation of medical and surgical forms of treatment. It is generally accepted that hypertension is mediated in most instances by an increase of the resistance offered by the peripheral vascular bed to the flow of blood. Close co-operation between clinical studies and the experimental and pathological laboratories has been responsible for the development of an understanding of vasopressor mechanisms by which the peripheral resistance may be increased. The majority of the studies have been directed toward the understanding of the renal humoral hypertensive mechanism. They have led to the development of tissue extracts that theoretically neutralize or inactivate the end product of the renal vasopressor mechanism. These extracts have been given limited clinical trial in the last few years. The minority of these experimental studies have been directed toward an understanding of the role of increased central vasoconstrictor tone in hypertension. They have given additional information relative to surgical treatment by sympathectomy.

Surgical treatment of clinical hypertension also dates back about ten years. Its development has been considerably influenced by the progress made in experimental laboratories. Clinical hypertension was first treated surgically by kidney denervation, local denervation of the splanchnic area with or without partial adrenalectomy, celiac ganglionectomy, kidney decapsulation, and nephrectomy. More recently transdiaphragmatic splanchnicectomy (Smithwick, 60), and total thoracic and subtotal or total lumbar paravertebral sympathectomy and splanchnicectomy (Grimson, Alving, Adams, Gans, 28) have been used.

From the Department of Surgery, University of Chicago, Chicago, Illinois.

This review of the problem of hypertension will first cover the developments in the experimental laboratories and then their clinical interpretation. The experimental studies have their origin chiefly from the demonstration of renal hypertension (Goldblatt, 23), and neurogenic hypertension (Heymans and Bouchert, 35, and others). The development of surgical procedures for the treatment of hypertension and the physiological basis offered for each procedure will be discussed later.

EXPERIMENTAL RENAL HYPERTENSION

Goldblatt and his associates (25) demonstrated in 1933 that partial obstruction of renal arteries could produce a persistent hypertension in dogs. It has since been established that under conditions of altered blood flow through the kidney, a substance, renin, is liberated into the circulation. It reacts with a substance, renin activator or hypertensinase, to form angiotonin (Page and Helmer, 49) or hypertension (Braun-Menendez, Fasciolo, Leloir, and Munoz, 8). This substance has a vasopressor action. These stages in the development of the renal hypertension mechanism have been rather generally accepted. The more recent, and as yet unconfirmed reports of Grollman, Williams, and Harrison (30), and Page, Helmer, Kohlstaedt, Fouts, and Kempf (50), of the existence of a substance that may be extracted from kidneys, which inactivates or neutralizes the vasopressor action of angiotonin or hypertensin, suggest clinical possibilities. The use of this kidney extract in small groups of hypertensive patients has been reported (Harrison, Grollman, and Williams, 31; Page, Helmer, Kohlstaedt, Kempf, Gambill, and Taylor, 51; and Murphy, Grill, Langenfeld, Kurten, and Guenther, 45). It was reported to produce some reduction of blood pressure in hypertensive patients. Page, in discussion of the report by Murphy and his associates (45), points out that all of the kidney extracts which have been employed are crude. He further states, "I do not consider the administration of kidney extract a practical treatment for hypertension at present. Whether it will become practical depends upon future research, which is altogether unpredictable." Extensive studies in progress in many laboratories should clarify this aspect of

the renal hypertension problem. Little encouragement has been given by laboratory studies to the use of any form of sympathectomy in renal hypertension (27).

The suggestion by Bright in 1827 that the kidney may play an etiological role in hypertension has been amply confirmed. The kidney may under conditions of altered blood flow increase the general peripheral resistance experimentally. Removal of a kidney has relieved hypertension in certain instances of unilateral surgical renal disease. This observation strongly suggests the clinical existence of the Goldblatt kidney phenomena. Crabtree and Chaset (13) in reporting 150 nephrectomies state that hypertension was not a common finding although vascular changes which have been considered to be causative factors in the production of hypertension were present in a high percentage of their cases. Nephrectomy was not followed by appreciable reduction in the blood pressure. Braasch (6, 7) in a recent study states that less than 1 per cent of hypertensive patients are amenable to renal surgical treatment. Hypertension was relieved for a year or more by nephrectomy in 65 of 198 patients with hypertension and surgical disease of one kidney. No specific type of renal pathological change was observed. A word of caution in this respect is warranted. Many hypertensive patients have already developed or are developing some degree of renal insufficiency. The removal of a functioning kidney without a definite surgical indication seems therefore to be contraindicated.

What role, aside from that observed in the unilateral surgical lesions of the kidney, does the renal mechanism play in clinical hypertension? Goldblatt is of the opinion that the so-called essential hypertension has its origin as an arteriolar disease and that this disease alters the circulation in the kidney and initiates the renal hypertension. Moritz and Oldt (44) have presented pathological evidence supporting this opinion. Page (48) presents evidence derived from the perfusion of rabbits' ears that the plasma of hypertensive patients and dogs has a vasoconstrictor action under certain experimental conditions that is possibly like that of angiotonin. The demonstration of vasoconstrictor properties in the blood of hypertensive patients is difficult.

Weiss (65) reviews the observations of Pickering, Prinzmetal, and Wilson, and others related to peripheral blood flow in hypertensive patients. He concludes that the increase in peripheral resistance is generalized. He is of the opinion that the major factors in hypertension are hormonal agents, arteriolar sclerosis, and in most patients, some degree of renal ischemia. Pickering (56) states, "The present trend of evidence inclines to the view that the hypertension is caused by a renal disturbance, and that in many instances this is ischaemic in nature."

The development of detailed methods for estimating effective renal blood flow, filtration rate, and tubular excretory mass in the patients, with diotrast and inulin clearances (Smith, Goldring, and Chasis, 59), has given direct evidence of the function and hemodynamics of the human hypertensive kidney. Goldring, Chasis, Ranges, and Smith (26), after reviewing studies of 60 hypertensive patients, state, "The functional picture presented by the hypertensive kidney is consonant with the theory that there is present in the blood in hypertensive disease one or more pressor substances which produce a reversible renal ischemia by constriction of the efferent glomerular arterioles. In addition, there is profound impairment and ultimate destruction of tubular function. Which of these precedes the other is as yet undetermined. There is no evidence in the present investigation to warrant the contention that renal ischemia is the primary cause of essential hypertension. The renal ischemia demonstrated here, which has its origin in increased tone of the efferent glomerular arterioles, appears to be one of the sequelae of the hypertensive process." Friedman, Selzer, and Rosenblum (21), reporting a parallel study, state, "it appears highly probable that renal ischemia, although present in the majority of the hypertensive patients herein examined, may well be a secondary or concomitant mechanism in the pathogenesis of essential hypertension. Thus the renal ischemia found in the hypertensive patient may be but a local manifestation of a generalized, systemic vasoconstriction, sharing in the latter, possibly aggravating it, but not primarily causing it."

Thus the evidence seems to be accumulating that in certain pathological conditions and in a late stage of hypertensive vascular disease, the renal hypertensive mechanism may play a role. There is as yet, however, no incontestable evidence that the renal hypertension mechanism initiates the so-called "essential hypertension" disease process in man.

NEUROGENIC HYPERTENSION AND SYMPATHECTOMY

Clinical observers have repeatedly called attention to evidence of vasomotor instability in hypertensive patients. The occurrence of an abnormally high response to the "cold pressor" test has been reported by Hines (37) and others.

Lowering of the blood pressure following rest, sedation, environmental change, or psychotherapy has been observed. Patients are occasionally seen with a definite persistent elevation of the blood pressure but without evidence of organic disease as represented by retinitis or altered renal function. Disease of this type has been classified by some authors as "neurogenic" or "central" hypertension. It is with this type of patients that surgical treatment either by partial or complete sympathectomy has given the best results.

The sympathetic nervous system with its control of vasoconstriction, adrenalin and sympathin liberation, and to a considerable extent heart rate, is the only important known mechanism capable of effecting on a reflex basis such a neurogenic hypertension. It is possible to effect an increased sympathetic vasomotor tone and produce an experimental neurogenic hypertension by disturbing reflex blood-pressure regulation by denervation of the carotid sinus and cardioaortic pressure-sensitive areas.

The production of this neurogenic or central type of hypertension experimentally dates back to about the same period as the Goldblatt hypertension. Koch and Mies (41) in 1929 and Koch (39) in 1931 demonstrated in rabbits and in dogs a chronic moderate hypertension. Koch and Mattonet (40), unfortunately, later reversed this statement and reported that after many months the blood-pressure elevation disappeared. Heymans and Bouchaert (35) in 1931 reported the first of a long series of studies of chronic enduring neurogenic hypertension in dogs reaching pressures at times of over 250 mm. of mercury. This type of hypertension was achieved by eliminating the buffering influence of the pressor-sensitive areas of the cardioaortic region and of the carotid sinuses. Details of the method have been previously described (27).

The mechanism underlying this type of hypertension is readily understood. The vasomotor centers are constantly receiving afferent impulses from somatic, cortical, and visceral sources. These are apparently chiefly vasopressor. Other stimuli from pressor-sensitive zones of the cardioaortic region and the carotid sinuses exert a buffering or modulating influence upon the vasomotor center that usually balances the vasopressor stimuli and maintains a blood pressure level at about normal. Elimination of the buffer nerves from these pressor-sensitive areas effects reflexively an increased response of the vasomotor center to vasopressor stimuli, an increased sympathetic vasoconstrictor tone, and a hypertension. Studies chiefly in European laboratories related to blood-pressure regulation through the modulator nerves have been reviewed by Heymans (34) in 1938. In this country Nowak and Walker (47), Nowak (46), Thomas and Warthin (62), the author (27), Schafer (58), and others have confirmed the existence of this type of hypertension.

The effect of complete sympathectomy and of denervation of the splanchnic area on experimental renal and neurogenic hypertension has been studied. Complete paravertebral sympathectomy was first reported in cats by Cannon, Newton, Bright, Menkin, and Moore in 1929 (10). They state that after sympathectomy "emotional excitement causes no erection of hairs, no consistent increase of blood sugar, no polycythemia, no relative increase of mononuclear cells, and as shown by a few observations, no marked rise of arterial blood pressure." Further studies of complete sympathectomy in dogs by Cannon (9), Wilson, Roome, and Grimson (67), Grimson, Wilson, and Phemister (29), Freeman and Jeffers (19), Grimson (27), Schafer (58), and others, have supported the conclusion that immediately after complete sympathectomy, the central vasomotor tone and the central reflex mechanism for elevating the blood pressure are interrupted. This effects a lowering of the blood pressure. Attention has been directed to the observation (29) that the blood pressure begins to increase within a few weeks of the total sympathectomy and reaches the preoperative level in an average time of six months. "A central nervous mechanism capable of elevating blood pressure is present during and after the stage of blood pressure recovery. The nature of this vasoconstrictor mechanism is not well understood. Anatomic evidence indicates the possibility of preganglionic regeneration to outlying visceral sympathetic ganglia and adrenals." Recovery of vasoconstriction is incomplete. These observations place a limitation upon the duration of the blood-pressure lowering that might be expected after partial or complete sympathectomy in man.

It has been demonstrated (27) that splanchnicectomies of various types will not appreciably alter the blood pressure of a normal or a neurogenic hypertensive dog, or the ability of a normal dog to respond by increased blood pressure to increased intracranial pressure. Complete sympathectomy, on the other hand, lowers a normal dog's blood pressure, lowers a neurogenic hypertensive dog's pressure to normal for a time, following which there is an incomplete recovery, and abolishes the vasopressor response to increased intracranial pressure. This latter observation has been confirmed by Freeman and Jeffers (19). In

addition, these authors suggest that cardiac and adrenal denervation alone will lower the response to increased intracranial pressure. They have considered the possibility of combining transdiaphragmatic splanchnicectomy and cardiac denervation in the treament of patients with hypertension.

CORRELATION OF EXPERIMENTAL AND CLINICAL HYPERTENSION WITH SURGICAL TREATMENT BY SYMPATHECTOMY

Physiological studies dealing with experimental renal hypertension have on the whole given little encouragement to the therapeutic use of any form of sympathectomy in hypertension of a renal variety in man. Even complete sympathectomy does not appreciably alter the experimental renal hypertension of the Goldblatt type (Heymans and coworkers, 36; Freeman and Page, 20; Alpert, Alving, and Grimson, 5; and Verney and Vogt, 63). This demonstrates that the humoral product of the renal hypertension acts directly upon the vascular bed and is independent in action from the sympathetic nervous system. It suggests that in hypertensive patients in whom a renal mechanism might play an important role, the sympathetic denervation of large vascular beds could not protect them from vasoconstriction by the renal humoral vasopressor substances. It has been suggested that the sympathectomy might act by altering the blood flow through human hypertensive kidneys and thus alter the production of renal pressor substances. Careful clinical studies of renal circulation by diotrast and inulin clearance before and after complete sympathectomy in hypertensive patients (Alving, Adams, and others, 1) and before and after splanchnicectomy (Foa, Woods, and Peet, 17, 18; Corcoran and Page, 11; and Goldring, Chasis, Ranges, and Smith, 26) have shown no consistent change in renal hemodynamics even in those patients who had a lowering of blood pressure. These findings are compatible with the suggestion that organic arteriolar disease of an irreversible nature might be present. It has been suggested therefore (17, 18, 11) that the beneficial effect is one of a change of pulse pressure rather than of blood flow. This has not been demonstrated.

Physiological studies dealing with experimental neurogenic hypertension have given more encouragement to surgical treatment by sympathectomy. Complete sympathectomy will abolish this type of experimental hypertension. The regeneration that follows is incomplete and incapable of restoring the hypertension to its previous level (Fig. 1).

Interpolation of the experimental renal hypertensive mechanism into the hypertensive disease process in man has been popular. The disease process can be almost entirely reproduced experimentally even to the stage of malignant hypertension. Goldblatt (24) cautions, "The arteriolar sclerosis, which is an important part of the disease process in man, does not develop in the dog with prolonged experimental renal hypertension without renal excretory insufficiency." This he refers to as the benign phase of experimental renal hypertension. He has also found that arteriolar necrosis and necrotizing arteriolitis, similar to the lesions found in malignant human hypertension, occurred only in animals with hypertension and significant renal damage, as indicated by renal excretory insufficiency. He has concluded, in the dog at least, "hypertension alone is not a sufficient condition for the production of simple arteriolosclerosis or of the necrotizing arteriolar lesions."

Interpolation of the experimental neurogenic hypertension mechanism into the hypertensive disease process in man has, on the other hand, not been popular. It has been possible by this means to produce high blood pressures for many years. The pressure levels may fluctuate but the hypertension usually persists under anesthesia. Malignant hypertension has not been observed. Arteriolar sclerosis and renal insufficiency also have not as yet been demonstrated. Weeks after the production of the hypertension, a polycythemia develops (Schafer, 58). These observations stand in the way of complete interpretation of experimental renal or neurogenic hypertension into the clinical disease process. There is at present some incomplete evidence that a prolonged neurogenic hypertension will produce vascular changes in the kidney.

It is possible to offer as a pure hypothesis an etiological sequence of events producing the complete picture of hypertension in man. A patient could develop, at an early age, a disturbance of blood-pressure regulation. This need not be as complete as that which follows division of the buffer nerves in animals. It might be rather an increased sensitivity to stimuli or an increased number of psychic, somatic, and visceral vasopressor stimuli. With it the regulating mechanisms may become readjusted to a higher blood-pressure level. This would effect over the vasomotor center an increased sympathetic vasopressor tone, especially during periods of emotional strain. At this stage little organic disease would be present and rest and sedation would lower the blood pressure to normal. Over a period of time arteriolar

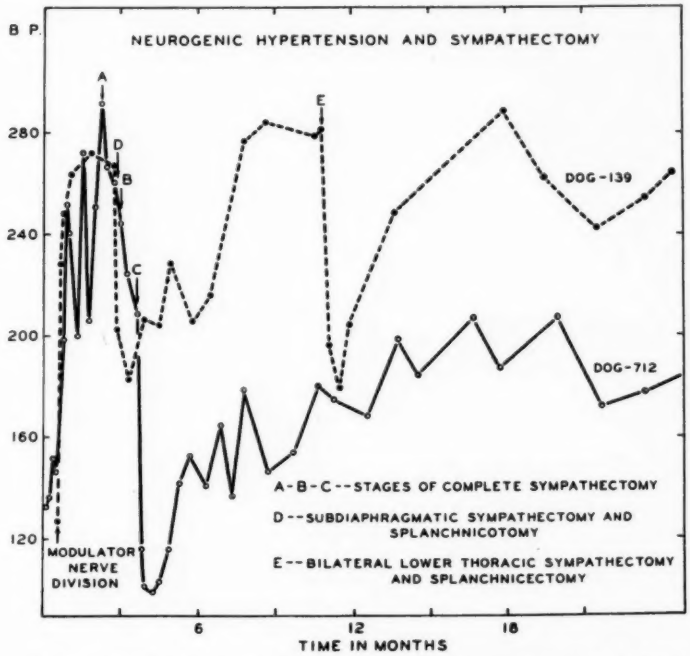


Fig. 1. The effect of sympathectomy on the blood pressures of two dogs with neurogenic hypertension. This hypertension was produced by division of the modulator nerves. Total paravertebral sympathectomy was performed on dog 712 in three stages, A, B, and C. Bilateral subdiaphragmatic splanchnicotomy and lumbar sympathectomy (D) and later bilateral lower thoracic sympathectomy and splanchnicectomy (E) were performed on dog 139. Some restoration of hypertension occurred after each procedure. The complete sympathectomy effected a more pronounced lowering of the blood pressure than the partial sympathectomies. The restoration of the blood pressure after the total sympathectomy was incomplete.

sclerosis might then develop, and as the kidneys became involved the renal hypertension mechanism might become active. Three major etiological factors could then play a terminal role: the inciting neurogenic factor, the organic vascular disease factor, and the renal factor.

Hypertension explainable on this hypothesis could be benefited by surgical treatment. In the early stage sympathectomy might restore blood-pressure regulation to normal by interrupting partially or completely efferent vasopressor pathways. If the disturbance of regulation were not severe, denervation of only part of the vascular bed, such as the splanchnic area, might be sufficient. If it were more severe, approaching the complete disturbance produced by sectioning the buffer nerves in dogs, then from experimental evidence complete sympathectomy would be necessary. The benefit of complete sympathectomy would be limited by the incomplete late recovery that would be effected largely by nerve regeneration. In the intermediate stage during the development of arteriolar disease, extensive sympathectomy might be expected only to completely or partially neutralize the inciting factor of disturbed blood-pressure regulation and although arresting the progress of the disease it might not restore blood pressure to normal. In the later stage with renal arteriolar sclerosis, sympathectomy might again be expected to remove completely or partially the inciting factor of disturbed vasomotor regulation, but would leave the vascular disease, and the renal humoral element for which as yet no generally available specific treatment is established. This sequence of events is entirely hypothetical, and further clinical and laboratory study will be necessary to test its validity. It is, however, compatible with certain

observed clinical effects of sympathectomy. It is also compatible with the observations of Corcoran and Page (12) and others directly interested in the renal aspect of clinical hypertension. These authors state, "The clinical picture and course of each case of hypertension is therefore probably a composite of the degree and kind of renal, endocrine, and nervous participation."

SURGICAL TREATMENT BY SYMPATHECTOMY

Surgical treatment of hypertension by splanchnicectomy has gradually achieved some degree of general recognition. There is little doubt that many patients are benefited by the procedure. In some the benefit is associated with a lowering of the blood pressure and in others it is chiefly symptomatic.

A definite evaluation of any form of therapy in hypertension is difficult. It is impossible by the most careful clinical evaluation to predict accurately in each patient the course of the disease or the life expectancy. The statistical study and classification of hypertensive vascular disease by Keith, Wagner, and Barker (38), and of vascular fundus disease by Gifford and MacPherson (22) have been of aid in prognosis. However, patients may be observed with severe hypertension and retinitis during an episode of hypertensive encephalopathy or nephritis that will improve greatly without surgical treatment. Such patients if operated upon when first seen would inadvertently be listed as having excellent postoperative results. It is only by prolonged preoperative study with numerous blood-pressure readings in the out-patient department or office, and then preferably for several weeks in the hospital with careful medical observation and management, that such errors may be as nearly as possible avoided. Such observations have been made on patients before and after splanchnicectomy, and on a few patients before and after subtotal or total paravertebral sympathectomy.

Adson, Craig, and Brown (3) in 1936, and Heuer (32) in 1937 gave excellent reviews of the earlier surgical treatment of hypertension, from the suggestion in 1923 by Daniélopolu, Bruening, Kraus, and Pende that the splanchnic nerves be divided, through the intermediate surgical efforts of Piere, Rossi, and others, to the development in this country of denervation of the splanchnic area by rhizotomy (Adson in 1930), subdiaphragmatic splanchnicectomy (Craig in 1932) and later Adson, and supradiaphragmatic splanchnicectomy and lower dorsal ganglionectomy (Peet in 1933). Martin (43) in 1938 also gave an excellent detailed review of the early surgical literature. At the present time surgical treatment by splanchnicectomy has been performed in more than 3,000 hypertensive patients. Reports covering smaller series of patients usually in an advanced stage of the disease are on the whole discouraging. Reports of larger series of patients, many at early stages of the disease, are more encouraging. This review cannot conveniently cover all publications. An effort will, however, be made to review those that deal with the origin of the various operative approaches and those giving the longest postoperative studies.

BILATERAL SECTION OF ANTERIOR SPINAL NERVE ROOTS FROM THE SIXTH THORACIC TO THE SECOND LUMBAR, INCLUSIVE

Adson and Brown (2) in 1930 treated a patient with malignant hypertension by intraspinal anterior nerve-root section from the sixth thoracic to the second lumbar segments, inclusive. Between October, 1933, and October, 1935, this extensive rhizotomy was performed on a series of 27 patients. The authors hoped by this procedure, "(1) to sympathectomize sufficient arteries to modify arterial responses, (2) thoroughly to sympathectomize the suprarenal glands, and (3) to remove the effects of intra-abdominal tension." The lowering of the blood pressure and decrease of vasopressor reactions that were observed during spinal anesthesia stimulated this approach. Adson, Craig, and Brown (3) make an early report on these patients and list the results as good 13, fair 6, failures 6, and deaths 2.

Page and Heuer (52) in 1935 reported the first of a series of 17 cases treated by a one or two-stage procedure similar to that of Adson. Details have been reported by Page and Heuer (53) and Heuer (32). They state, ". . . the splanchnic vessels constitute an important but not the only flexible reservoir which governs the level of the arterial pressure . . . it appears to be justified to attempt to abolish the extrinsic vasomotor control of this area by section of the anterior nerve roots with the hope of reducing the arterial pressure." Twelve of the patients had an early favorable response. Heuer and Glenn (33) caution against interpretation of postoperative observations that have not exceeded five years. They state that 12 of 19 patients operated upon five or more years ago are dead. The patients with malignant hypertension all died. The longest period of survival was three years and nine months. Seven of the others have survived six or seven years. Relief of symptoms, improvement in the fundi, and some lowering of the blood pressure were observed. In some of these cases the course

of the disease may have been interrupted and life prolonged. Heuer (32) states, "The operation is undoubtedly the most formidable, the most time-consuming and, in one respect, the most dangerous of the operations for hypertension. Its danger lies in the possibility of an accident to the cord with the appearance of symptoms of a transverse lesion." The operation is not now, to the knowledge of the author, being employed in hypertension. This series does, however, afford one of the best long range studies of the surgical treatment of hypertension by denervation of the splanchnic area. Both Adson and Heuer reported the occurrence of a postoperative postural hypotension

BILATERAL SUPRADIAPHRAGMATIC SPLANCHNICECTOMY AND LOWER DORSAL GANGLIONECTOMY

The first splanchnicectomies suggested or performed by Bruening, Pende, Pieri, Rossi, and others were of this type but were usually unilateral and incomplete (3, 32, 43). Peet in 1933 developed his technique for bilateral removal of the tenth, eleventh, and twelfth thoracic sympathetic ganglia, lesser splanchnic nerves, and from 9 to 13 cm. of the greater splanchnic nerves. This operation has been used by Peet in a series of more than 800 patients. Details of 350 consecutive case studies have been reported (Peet, Woods, and Braden, 55; and Woods and Peet, 68). These authors state, "Evidence points to renal ischemia, no matter what the cause, as the usual basic factor in hypertension. The rationale on which we base our operative procedure is therefore the relief of renal ischemia by interruption of the sympathetic vasoconstrictor outflow to the kidneys." This statement is open to serious criticism. The observations quoted above (26, 1, 11) and those of Foa, Woods, and Peet (17, 18) in hypertensive patients before and after sympathectomy have shown no consistent change of renal blood flow. The authors (17, 18) have therefore changed their hypothesis and state that "reduced renal pulse pressure and not renal ischemia is the cause of hypertension." They suggest that a reduction of pulse pressure inside of the kidney may accomplish the benefit observed after sympathectomy. This has not been demonstrated.

Peet, Woods, and Braden (55) report a significant lowering of the blood pressure in 51.4 per cent of the patients. Woods and Peet (68) report the results for from five to seven years in the first 76 patients of this series. In this smaller group 42 per cent had a significant lowering of the blood pressure. The authors have grouped their patients according to the Wagner-Keith (64) classification. From five- to seven-year survivals are given: in Group 1, 4 of 4 patients operated upon are alive; in Group 2, 6 of 15; in Group 3, 21 of 33; and in Group 4, 7 of 24. This makes a total of 39 or 51 per cent of the original 76 which survived for more than five years. The comparison of these survival statistics with those of the Wagner-Keith report are interesting and instructive. It is, however, as pointed out, not possible to make a direct unreserved comparison unless it can be established that all patients in the medically treated series would have or could have been treated surgically. Some selection of patients for surgery exists in every series. Even with this consideration and the difficulty which the authors must have experienced in making proper preoperative and postoperative studies upon such a large series of patients, their conclusion "that the surgical treatment offers a better prognosis in cases of severe hypertension than any other form of therapy as yet reported" seems acceptable. The results reported in the malignant type of hypertension are better than those of other authors. It is noteworthy that the poorest results were obtained in patients evidencing arteriolar disease, Group II, and that the most encouraging were obtained in Group III. Postural hypotension following this procedure has apparently not been significant.

Many surgeons have performed this operation upon limited series of patients. Their results have for the most part been less satisfactory. White and Smithwick (66) report no significant result in 60 of 66 hypertensive patients operated upon. Davis and Barker (15) report little effect from the operation alone in patients resistant to sulfocyanate therapy, but they believe that response to cyanate therapy is increased after operation.

Page and Heuer (54) using a supradiaphragmatic splanchnicectomy similar to that of Peet but including less of the thoracic chain state, "The therapeutic results in this small but representative group of cases do not appear to us to be encouraging." Rytand and Holman (57) report their experience in 40 patients. Nineteen patients died within the first one and one-half years after operation. Nine patients were not benefited. Six had symptomatic improvement without lowering of the blood pressure and 6 (5 with normal fundi) had an average lowering of from 200/120 to 155/100 and seemed to show improvement.

SUBDIAPHRAGMATIC SPLANCHNICECTOMY WITH RESECTION OF THE FIRST AND SECOND LUMBAR GANGLIA

Subdiaphragmatic splanchnicectomy was proposed by Pereira, and first performed by Craig in

1932. Adson in 1935 proposed and carried out the first of a long series of bilateral subdiaphragmatic splanchnicectomies including the splanchnic nerves as they enter the abdomen and the first and second lumbar ganglia (3). Partial adrenalectomy was also carried out in the earlier cases. The physiological considerations were the same as those considered when section of the lower dorsal and upper lumbar anterior nerve roots was introduced. It is of interest that Allen and Adson (4) state, "Sympathectomy is not carried out because we have assumed that the increased resistance to the flow of blood is localized to the splanchnic region. On the contrary we accept the evidence that the increased resistance offered to the flow of blood through the arterioles is present over the entire body. If the surgeon is to accomplish the best results from the neurosurgical treatment of hypertension, he should sever the connections of the sympathetic nerves with almost all portions of the body. Unfortunately this is impracticable or even impossible." The author agrees with the first part of this statement. It has been possible with recent developments in the technique of intrathoracic surgery to perform subtotal and total paravertebral sympathectomy (28). The operation is formidable. Although the results to date are promising, further study is needed to determine whether total sympathectomy is practicable.

Allen and Adson (4) report their results in 224 hypertensive patients observed from a few months to five years after subdiaphragmatic splanchnicectomy and sympathectomy. There was no operative mortality. Thirty-four patients died during the study and 6 have developed hemiplegia. The authors report that 13 per cent of the results were good, 18 per cent fair, 39 per cent temporary, and 30 per cent poor. In Group I, 45 per cent were good or fair, in Group II, 33 per cent, and in Group III, 26 per cent, while in Group IV there were no good or fair results. The authors believe that by observing the lowering of the blood pressure in response to rest and sodium amytal and intravenous pentothal sodium it is possible to predict the benefit that might be derived from operation. By operating upon 11 Group I, 137 Group II, 69 Group III, and 4 Group IV patients, they selected earlier stages in the disease than most other authors. Woods and Peet (68), for example, in 345 supradiaphragmatic splanchnicectomies selected 12 patients with normal fundi, 15 of Group I, 77 of Group II, 147 of Group III, and 94 of Group IV. Improvement in patients with malignant hypertension might justify a greater operative risk.

Heuer and Glenn (33) report 18 cases treated by the subdiaphragmatic approach. "The reduction in the blood pressure which occurred following the operation was marked but tended to return to the pre-operative level within a period of six months. There was marked subjective improvement." Leonard and Oughterson (42) report 12 cases operated upon with excellent results in 1, moderate in 4, slight in 2, and failure in 5.

CELIAC GANGLIONECTOMIES

Crile (14) reports 535 operations upon the "adrenal sympathetic" system. The earlier operations were partial adrenalectomies. Two-hundred and thirty-four patients were operated upon by a technique designed to resect the celiac ganglia, break up the "sympathetic complex," and denervate the aorta itself. The operation was proposed partly as a result of studies of comparative anatomy and partly as a result of clinical experience. Crile reports a lowering of the systolic blood pressure of 40 mm. or more in 42.9 per cent of the patients; 7.1 per cent had a reduction of more than 75 points. Crile concludes, "If a patient with hypertension is operated upon in the early stages of the disease it is as curable as is cancer of the breast when it is operated on in the early stages."

Celiac ganglionectomy has not been widely performed, and the role of the "adrenal sympathetic complex" has not been widely considered in dealing with clinical hypertension. The operation has, however, one definite advantage, not referred to by Crile. It is possible that the celiac and periaortic sympathetic ganglia offer effective pathways for functional regeneration after many varieties of splanchnicectomies and that by removing these ganglia Crile may have blocked this regeneration to a large extent.

COMBINED LUMBODORSAL (TRANSDIAPHRAGMATIC) SPLANCHNICECTOMY

The supradiaphragmatic and the subdiaphragmatic sympathectomies both failed to accomplish an anatomically complete denervation of the splanchnic area. The logical combination of these two procedures into transdiaphragmatic splanchnicectomy was developed by Smithwick (60) in 1938. This was proposed purely on the basis of clinical observation because "the various operations which we had employed did not consistently produce significant postural changes or produce comparable blood pressure changes in similar cases in the horizontal position." A long segment of the splanchnic nerve together with the lower

four thoracic sympathetic ganglia, and in many patients the first and second lumbar ganglia, was removed. It is Smithwick's impression that as the operative procedure was extended to include the first and second lumbar ganglia, postural hypotension increased and lowering of the blood pressure (horizontal position) was more consistent.

Smithwick (61) is impressed with the role of a renal factor in clinical hypertension and states, "... it is apparent that man is supplied with neurogenic and humoral control over the renal circulation. This control is intermittent, not continuous. If called into play with sufficient frequency, it could result in a significant reduction of renal blood flow. . . . It seems probable that varying degrees of sympathetic activity combined with varying degrees of vascular reactivity and pathology produce the necessary critical change in renal blood flow. The foregoing discussion is purely speculative and is based upon the premise that alteration of renal blood flow, however it may be brought about, is a necessary preliminary to hypertension. Some such complicated mechanism is necessary to explain the variable results in patients on whom identical operations have been performed at very similar stages of the disease." Smithwick also recognizes that the effect might be purely passive by relaxation of a large portion of the vascular bed, which lowers the blood pressure, and permits a regression of vascular disease particularly, he believes, in the kidney. Corcoran and Page (11) believe that a failure of venous return from the denervated splanchnic area is responsible for the lowering of the blood pressure and that this may for a time interrupt the development of renal arteriolosclerosis. Smithwick considers the postural hypotension present in the early weeks after total splanchnicectomy an important but not the sole explanation for the observed lowering of the blood pressure.

The early results of transdiaphragmatic splanchnicectomy in 34 patients followed up from four months to two years are reported (60, 61). In 7 patients of 8 with known renal disease the effect was not significant. Among the remaining 26 patients a significant effect was noted in 6 of 8 belonging to Group I, 5 of 5 in Group II, 2 of 6 in Group III, and 4 of 7 in Group IV. Smithwick concludes, "From our experience, we are convinced that better clinical results follow extensive rather than partial splanchnic denervation."

This operative procedure affords a better exposure of the lower dorsal and upper lumbar sympathetic ganglia than previously described procedures. It is now being adopted by many surgeons. DeTakats (16) reports 15 cases but gives no details. Smithwick and DeTakats consider an immediate postoperative postural hypotension to be characteristic of a complete denervation of the splanchnic area and especially of the resection of the first and second lumbar ganglia. The author has noted this postural hypotension in a few patients operated upon according to the Smithwick procedure. The hypotension is less, however, than that observed in a few patients who were treated by a bilateral complete thoracic sympathectomy and splanchnicectomy that did not include the first and second lumbar ganglia. The postural effect appears, then, to be related to the extent of the sympathectomy rather than to the completeness of the denervation of the splanchnic area. The postural hypotension following the splanchnicectomies was associated with a tachycardia. This was not observed following the subtotal or total sympathectomies because of the cardiac denervation.

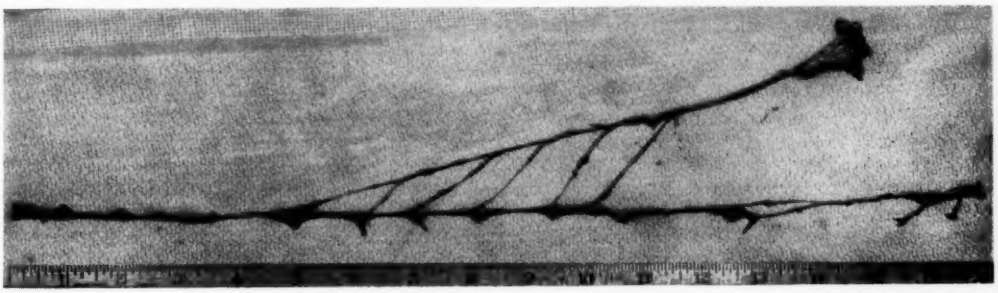
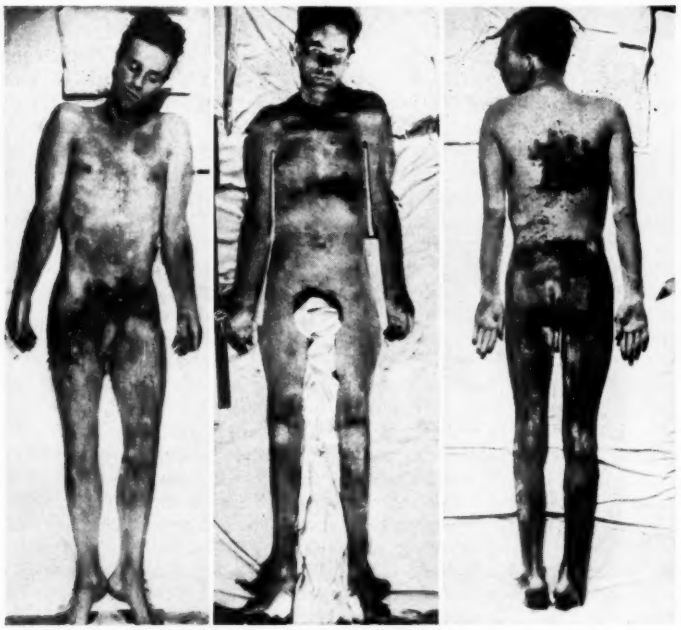


Fig. 2. Sympathetic chain removed from the right side of a patient during a transthoracic sympathectomy. The stellate ganglion is at the top, the splanchnic nerve and celiac ganglion are at the right, and the first two lumbar ganglia are at the lower left. The upper lumbar ganglia are frequently not accessible. They have been removed later through a transabdominal approach in some of the patients.



a b c

Fig. 3. Starch, iodine, heat sweating tests of the entire body in 3 patients after sympathectomy. Dark areas of sweating are present in the groin in Patient a, twelve days after bilateral transthoracic sympathectomy, and on the left chest in Patient b, twenty-seven days after a similar operation. Irregular patchy sweating on the back of Patient c is present one hundred and forty-seven days after a bilateral thoracic sympathectomy which did not include the lumbar ganglia.

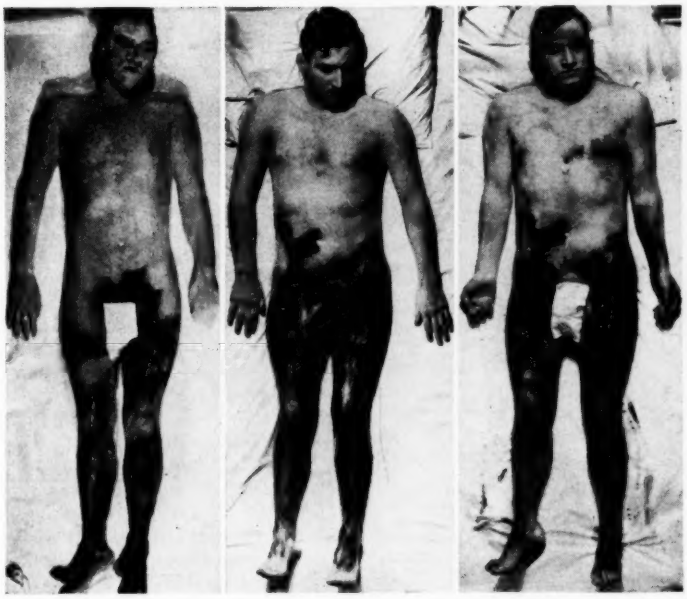
It seems that at the present time the transdiaphragmatic splanchnicectomy is the operation of choice for denervation of the splanchnic area.

SUBTOTAL TO TOTAL PARAVERTEBRAL SYMPATHECTOMY

The possible value of complete sympathectomy as a therapeutic procedure in clinical hypertension, as stated above, was considered by Allen and Adson (4). Sympathectomy of the first patients operated upon was completed by the author in May, 1940. The operative technique has been reported (28). It consists of a transthoracic and also at times transabdominal removal of the paravertebral sympathetic chains, including the stellate ganglia, both thoracic chains, the celiac ganglia, and frequently the first and second lumbar ganglia (Fig. 2).

The physiological principles involved have been discussed under Sympathectomy and Neurogenic Hypertension, and Correlation of Experimental and Clinical Hypertension with Surgical Treatment by Sympathectomy. The procedure was proposed because, from experimental evidence, it might accomplish more than denervation of the splanchnic area, especially if there is a component of neurogenic nature in clinical hypertension.

Experience with the incomplete restoration or regeneration of central vasomotor control that follows complete sympathectomy in dogs (29) prompted the author to remove all accessible sympathetic ganglia including both celiac ganglia. Heat-iodine-starch-sweating tests were performed at intervals after sympathectomy (Figs. 3 and 4). Recovery of sweating in patches was observed in all patients. It appears in the first few months and in a year or more may involve roughly from 5 to 30 per cent of the denervated area. Recovery of sweating is greatest in the trunk and groin, little and late in the extremities, and has not been observed on the head and neck. The sympathetic chains have been removed intact in many patients down to and occasionally including the first and second lumbar ganglia. It



a b c

Fig. 4. Starch, iodine, heat sweating tests on 1 patient. a represents the test thirty-two days after bilateral transthoracic sympathectomy. b represents a test at one hundred and eleven days, and c at one hundred and ninety-seven days. The thoracic chains, splanchnic nerves, celiac ganglia, and first lumbar ganglia were removed. At one hundred and eleven days (b) sweating is present in the areas supplied by the eleventh thoracic nerve on the right and the twelfth thoracic and first lumbar nerves on both sides. At 197 days (c) an additional area has appeared in the region supplied by the fifth and sixth thoracic nerves on the left.

seems probable that the recovery seen is effected by nerve regeneration through aberrant or overlooked fragments of sympathetic ganglia. It is, unfortunately, not possible to determine accurately to what extent recovery of visceral vasomotor control occurs. Seven patients have shown varying degrees of late incomplete restoration of the blood pressure. Five have shown a late additional lowering of the blood pressure. This suggests an actual reversal of the disease process. The cold pressor response may be eliminated for a few weeks after the most complete sympathectomies but later equals that observed before operation. The diminished heart rate persists. Pulse rates between 40 and 60 are frequent. Postural hypotension occurred in each patient. Early it is marked. Later the postural hypotension has been less marked. It has persisted during the entire period of observation in all but 1 patient.

Eighteen patients have now had from subtotal to total paravertebral sympathectomies. Four were of the Keith-Wagner Group I; 4 of Group II; 4 of Group III; and 6 of Group IV. Five patients had had preoperative cerebral accidents with hemiplegia and 2 others had had severe episodes of hypertensive encephalopathy. One patient in Group III and 2 in Group IV, all in an advanced stage of the disease, died soon after operation. In 2 the lowering of the blood pressure in the presence of badly diseased cerebral arteries produced a sudden respiratory arrest on the second and fifth postoperative days. A late pneumonia and uremia accounted for the third death.

The 15 patients who survived the operation have been observed from five to twenty-four months and are still alive. This may be significant or may simply mean that those with a shorter life expectancy did not survive the operation. The clinical impression is that some of the patients, especially those in Group IV, are already living beyond their predicted life expectancy.

The effect of the operation upon the blood-pressure levels in the 15 patients is represented in Table I. The O.P.D. values represent the mean

TABLE I.—EFFECT OF TOTAL THORACIC AND PARTIAL TO TOTAL LUMBAR SYMPATHECTOMY AND CELIAC GANGLIONECTOMY ON THE BLOOD PRESSURE OF 15 PATIENTS WITH HYPERTENSION

Keith-Wagner group	Age of patient	Preoperative blood pressure		Postoperative blood pressure			Time in mos.
		Supine Position		Supine Position		Standing	
		O.P.D.	Hosp.	O.P.D.	Hosp.	O.P.D.	
I	25	190/116	166/100	130/84	108/70	120/70	24
I	38	210/138	180/120	186/128	174/108	162/120	22
I	32	200/126	170/118	110/75	120/80	70/50	7
I	27	180/108	180/110	152/100	140/94	90/60	5
II*	42	224/120	200/120	200/108	136/94	138/92	24
II*	40	196/120	180/116	170/104	138/88	122/90	18
II	18	204/140	190/130	128/74	126/86	114/76	17
II	25	180/126	160/118	120/72	116/76	116/70	7
III	40	264/136	220/122	246/138	200/114	180/100	21
III	33	240/150	228/138	260/150	200/142	196/120	20
III	44	220/124	170/120	196/122	160/100	122/90	15
IV*	50	278/148	220/130	234/130	172/102	152/118	21
IV*	42	238/154	202/132	240/140	210/134	180/130	9
IV	40	280/138	226/150	220/142	182/120	184/132	8
IV*	28	228/130	178/120	140/86	138/88	100/76	7

*Cerebral accident before operation.

of many readings obtained during office visits. The hospital values represent the mean of weekly averages of readings taken at least four times a day in the hospital. The preoperative and the late postoperative blood pressures are given. Two patients had no late lowering in the supine position. Five remained at relatively normal values. The postural hypotension seems to give some additional benefit. The immediate effect was more marked. Blood pressures in the supine position during the first few weeks after operation ranged from 180/116 in 1 patient to around 120/80 in 7 patients.

The average period of postoperative observation has been only fifteen months. It is probable that as time progresses further restoration of the blood pressure will be observed, and some of the patients will die of complications of hypertension. At present, however, symptomatic improvement has been remarkable and some patients previously incapacitated have resumed full activity. The conclusion seems justified that the progress of the disease has been either arrested or delayed in the 15 patients. The operative risk in late stages of the disease is evidently high. It is still too early to predict what the ultimate utility of the procedure ranging from subtotal to total paravertebral sympathectomy will be. The results have, however, been sufficiently encouraging to warrant a continuation of the treatment.

A contrast of the relative advantages and disadvantages of this procedure with those of extensive splanchnicectomy is of interest. The advantages seem to be a more consistent lowering of the blood pressure, a slow regular heart rate, a postural hypotension without tachycardia, and probably a decreased likelihood of sympathetic regeneration. The disadvantages are a greater operative morbidity and mortality, a decreased vital capacity, difficult postoperative management, a bilateral Horner's syndrome, occasional chronic nasal congestion, excessive sweating in patches, occasional prolonged weakness and postural disability, more extensive postoperative pain and psychic trauma, and in an occasional male patient some decreased sexual power.

Jerome Gans has studied the eye-ground changes. Hemorrhages, exudates, and papilledema have disappeared in some patients. The urea clearance has been slightly decreased immediately after the sympathectomy. Six months or a year later it has usually reached or exceeded the preoperative values. Symptomatic improvement has also been frequently observed. Alving and Adams have carefully investigated the general medical status and the cardiorenal circulation (1). They conclude that the blood-pressure lowering observed is not related to any change of cardiac or renal hemodynamics but to a generalized decrease in the peripheral resistance.

DISCUSSION

Clinical and experimental studies have contributed toward a preliminary understanding of physiological and pathological principles that may be involved in so-called "essential hypertension," or hypertension of unknown etiology. It is generally accepted that in this disease the increase of blood pressure is mediated by a generalized increase of peripheral resistance. Two factors that might initiate this increased peripheral resistance have been extensively studied in the experimental laboratories. One is the disturbance of vasomotor regulation observed in the so-called experimental neurogenic hypertension. The other is the humoral mechanism that follows experimental alteration of the renal circulation. At a late stage in the clinical disease pathological changes in the smaller blood vessels may cause an important part of the increased peripheral resistance.

Studies related to experimental renal hypertension have given little encouragement to surgical treatment by sympathectomy. Clinical treatment by splanchnicectomy or total sympathectomy has not appreciably altered the renal blood flow. Direct attacks have been made upon the kidney. There is little encouragement from reports of renal denervation, renal decapsulation, nephromyopexy, or nephro-omentopexy. The occasional association of a single diseased kidney with hypertension and its alleviation in some patients by nephrectomy is more encouraging. There is always some danger that the renal function which in many instances is already damaged by the hypertension will be further embarrassed by renal surgery.

Studies related to experimental neurogenic hypertension and sympathectomy have been more encouraging. They have established that complete sympathectomy will offset the complete reflex disturbance of blood-pressure regulation and hypertension that follows division of the modulator nerves of the carotid sinus and of the heart and aorta. The restoration of blood pressure to normal in these neurogenic hypertension experiments following complete sympathectomy is temporary and is followed by an incomplete late restoration of elevated blood pressure. This incomplete restoration of vasomotor control, probably by regeneration, should be considered in the evaluation of any form of sympathectomy. The disturbance of vasomotor regulation that may be present early in essential hypertension in man is probably not complete and might be corrected or compensated for in some patients by an incomplete sympathectomy.

The effect of surgical treatment of clinical hypertension by splanchnicectomy and by paravertebral sympathectomy (subtotal or total) has been reviewed. Benefits seem to have been achieved that are in general directly proportional to the extent of the sympathectomy and inversely proportional to the severity of the disease. Benefits have been observed in malignant hypertension following the more extensive sympathectomies. These observations are compatible with the hypothesis that the hypertensive disease process may be initiated by a disturbance of blood-pressure regulation and that later arteriolar sclerosis and the renal humoral mechanism may also play a role.

At present it is the impression of the author that surgical treatment by sympathectomy is indicated in many hypertensive patients. Splanchnicectomies, preferably transdiaphragmatic, may restore blood-pressure regulation to normal in the early stages of the disease. If they fail, however, it should not be assumed that the disease is not amenable to more extensive surgical treatment. Complete sympathectomy, if it proves a practical procedure, might then be effective. In the intermediate groups in which life expectancy under medical management is definitely limited and benefit from splanchnicectomies is inconsistent, complete sympathectomy might be employed. At a late stage of the disease, when the operative mortality from complete sympathectomy will be high, splanchnicectomy for palliation alone may be indicated.

CONCLUSIONS

Reports of the surgical treatment of hypertension by lower thoracic and upper lumbar anterior spinal nerve-root section, supradiaphragmatic splanchnicectomy, subdiaphragmatic splanchnicectomy, celiac ganglionectomy, transdiaphragmatic splanchnicectomy, and total paravertebral sympathectomy have been reviewed. Benefits have been reported in some patients after each procedure. Symptomatic relief has been marked. In general the lowering of the blood pressure observed has been directly proportional to the extent of the sympathectomy and inversely proportional to the severity of the disease. Most authors report some lowering of the blood pressure in from a third to a half of their patients. Benefits have been observed in hypertensive patients in an advanced stage of the disease.

It seems probable that sympathectomy should be employed early in the disease when possible. It also seems probable that extensive sympathectomy may be of value in many patients in a later and more hopeless stage.

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SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Berens, S. N.: The Surgical Approach to Meningiomas in the Region of the Sphenoid Ridge Causing Unilateral Exophthalmos. *West. J. Surg.*, 1942, 50: 225.

For the removal of meningiomas of the sphenoid ridge causing unilateral exophthalmos, the author uses the Swift modification of the Kroenlein operation instead of the usual transfrontal approach. This procedure is tolerated by patients of all ages and conditions of health; it makes the removal of the meningioma simple and complete, and it presents few hazards or technical difficulties. It is possible to remove the sphenoid ridge meningioma and decompress the orbit in the one operation.

After surgical preparation of the skin of the temple, forehead, and cheek, and irrigation of the conjunctival sac with bichloride of mercury solution, a crescentic incision is outlined along the lateral wall of the orbit (Fig. 1). This incision is about two and one-half inches long. Another incision is outlined extending backward from the margin of the orbit, along the superior margin of the zygoma. The eyelids are sutured shut, sterile pads are applied, and the incision is carried down through the skin and subcutaneous fascia to the periosteum of the lateral margin of the orbit and to the temporal muscle. Two flaps are turned back and held with retractors. The periosteum is incised and with the periosteal elevator the periosteum is stripped away from the lateral margin of the orbit. The anterior fibers of the temporal muscle are then incised close to their origin, and the temporal muscle is retracted, which exposes an area of sphenoid bone and a part of the frontal bone about the size of a silver dollar.

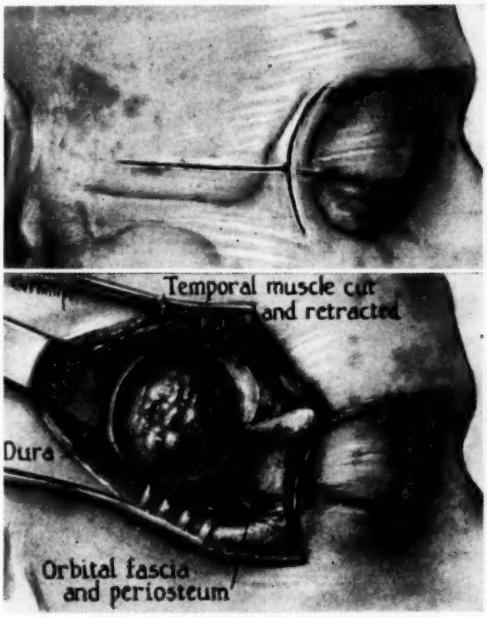

Fig. 1. Drawings which show the location of the incision, and the exposure midway in the bony decompression of the orbit and the middle fossa. One can see part of the meningioma involving the dura and sphenoid bone.

Fig. 2. Drawings show in black the areas of bone which are removed by this technique.

With a rongeur, portions of the sphenoid, frontal, and zygomatic bones which form the lateral wall of the orbit are removed for a distance of from three-quarters to seven-eighths of an inch. With a Hudson drill a trephine opening is made through the skull and enlarged with a rongeur to the size of a silver dollar. The rest of the sphenoid bone that forms the anterior wall of the middle fossa, the lesser wing of the sphenoid bone, and part of the inferior surface of the anterior fossa are gradually rongeured out (Fig. 2). Progressing deeply into the wound, being careful not to damage soft tissue, one is able to remove bone of the lesser wing of the sphenoid down to the anterior clinoid process without entering the dura, unless it is expedient to do so because of involvement of part of the bone by the meningioma or because of adhesions between the bone and the dura. The orbital vessels should be avoided. There are no other large vessels to cause troublesome bleeding. If the dura is opened, the tip of the temporal lobe may be elevated or retracted posteriorly. The inferior surface of the frontal lobe may be elevated and inspected. The examination may be carried extradurally or intradurally as far as the optic chiasm and sella.

The removal of the lesser wing of the sphenoid offers considerably more freedom intracranially than is obtained in the conventional Gasserian ganglion approach. After the removal of the meningioma, Tenon's capsule and the orbital fascia are split down to and including the annulus of Zinn. In closure of the wound the temporal muscle is sutured back into position; the periosteum over the lateral

wall of the orbit is sutured; and the superficial fascia and the skin are closed with interrupted sutures. A rubber band is frequently used for drainage and is removed within twenty-four hours. An external canthotomy is then performed—thus postoperative edema is prevented from completing the strangulation of the already impaired peripheral circulation of the orbit. After sterile dressings have been applied, atropine ointment is inserted into the conjunctival sac and both eyes are bandaged shut for forty-eight hours. DAVID J. IMPASTATO, M.D.

SPINAL CORD AND ITS COVERINGS

Campbell, E. P.: Meningococcal Meningitis; Report of 50 Cases, 40 Treated with Serum and 10 Treated with Serum and Sulfanilamide. *Ann. Int. M.*, 1942, 16: 694.

Among 40 patients with meningococcal meningitis who were treated with serum there were 20 deaths. Included among the deaths were 5 fulminating infections. In 10 patients treated with serum and sulfanilamide there were no deaths.

The type and potency of the serum and its route of administration were essentially the same in both groups. Practically all the serum used was of the highly concentrated type, 10 cc. of which represented 30 cc. of the unconcentrated variety. The average total amount of serum given to each patient in the serum group was 108 cc. In the group receiving serum plus sulfanilamide, an average of 109 cc. was given per patient.

From the results of this study, it seems clear that chemotherapy alone or in combination with immune serum is the most effective way of treating meningococcal meningitis. SAMUEL KAHN, M.D.

PERIPHERAL NERVES

Highet, W. B.: Splintage of Peripheral Nerve Injuries. *Lancet*, Lond., 1942, 242: 555.

Four principles of splinting paralyzed muscles are briefly stated, as follows:

1. A paralyzed muscle should be splinted in such a position that its point of origin is approximated to its point of insertion. Stretching by the action of gravity or by antagonist muscles should be avoided. Suitable splints should be applied as soon as the nerve injury is recognized.

2. Splintage of nerve injuries is not the equivalent of immobilization. In uncomplicated nerve injuries there is no damage to bones or joints and no need for immobilization. Continued and prolonged immobilization may lead to stiffness of movement which can nullify an excellent recovery in a peripheral nerve. All joints of the paralyzed limb must be allowed range of motion compatible with the continuous relaxation of all paralyzed muscles.

3. The splint must not press or rub on any insensitive area of skin if trophic sores are to be avoided, and must not interfere with the circulation by constricting the part.

4. The splint should be of such a type that the patient can carry out occupational therapy and in some cases return to work while wearing the splint. It should be removable in order that routine physical therapy can be employed.

The aim of physical therapy is threefold—to improve the circulation of the part by massage and galvanic exercises; to diminish muscle wasting and fibrosis by galvanic exercises; and to maintain the mobility of joints by active and passive motion. All splints are removed for two periods of one-half hour each day, and all joints of the limb are put through a complete range of passive movement. This entails transient stretching of denervated muscles. The author believes that this is beneficial in that it prevents muscle contracture. Occupational therapy should be purposeful and not merely diversional.

The author disagrees with the view that no splint is necessary in cases of median palsy. Without splintage an adduction contracture of the thumb is almost inevitable. A strip of adhesive applied from the thumb to the ulnar side of the hand is worse than no splint at all, since it increases adduction deformity. Highet uses an elastic splint which holds the thumb in a position of palmar abduction and opposition by means of two elastic strips fitted to a leather cuff at the wrist.

A proper splint for ulnar palsy is made with appreciation of the function of the interossei, lumbricals, and extensor digitorum communis. In intrinsic ulnar paralysis the extensor communis causes hyperextension at the metacarpophalangeal joints, while the long flexor tendons cause flexion at the interphalangeal joints. If the former joints are held in a position of slight flexion, the extensor communis can bring about powerful extension at the latter joints and prevent clawing. A "knuckle-duster" splint, which is similar to that described by the Kendalls, holds the metacarpophalangeal joints in slight flexion, relaxes the lumbricals and interossei, and prevents clawing of the fourth and fifth digits.

For radial palsy a modification of the splint recommended by the Medical Research Council after the last war is used. It is unnecessary to splint the interphalangeal joints in extension, since the lumbricals and interossei are intact and can carry out a powerful extension at these joints. The full-length cock-up splint which immobilizes the wrist and all the digits in complete extension is criminal. Proper splinting should hold the wrist in dorsiflexion, the thumb in radial abduction and extension, and the metacarpophalangeal joints in extension, but should not extend beyond the proximal phalanges to immobilize the interphalangeal joints.

In lesions of the lower trunk of the brachial plexus the paralysis involves chiefly the intrinsic muscles of the hand, and a combined median and ulnar splint is required. In lesions of the upper trunk the paralysis involves the deltoid, spinal muscles, and the flexors of the elbow, and supinators of the forearm. The ordinary abduction splint which is satisfactory for isolated deltoid paralysis is not sufficient

for a lesion of the upper trunk of the plexus. In such a case the limb must be splinted in a position of abduction and external rotation at the shoulder, flexion of the elbow, and supination of the forearm.

The author's splint has a universal screw at the elbow which permits flexion and extension at the elbow, pronation and supination of the forearm, and internal and external rotation at the shoulder.

Numerous photographs show the details of the various types of splints employed.

JOHN L. LINDQUIST, M.D.

MISCELLANEOUS

Storck, A. H., and Sabatier, J.: The Use of Estrogenic Substances in the Preoperative and Postoperative Treatment of Hypertension. *Ann. Surg.*, 1942, 115: 821.

There is experimental basis for the belief that estrogenic substances antagonize the metabolism-raising property of thyroxin in the tissues, and may reduce the secretion of the thyrotropic principle of the anterior pituitary lobe. Therefore it seemed rational to Storck and Sabatier to employ estrogenic substances in the preoperative preparation of thyrotoxic patients.

The number of cases was 11 in both the estrogenic and control groups, and the severity of the condition was slightly higher in the former, while the age was higher in the latter group. Three of the former group and 4 of the latter were toxic nodular goiters, while 4 of the former and 3 of the latter had multiple-stage operations. The basic preparation was the same in both groups and consisted of bed rest, sodium bromide, calcium gluconate, high calorie diet, liberal vitamin intake and Lugol's solution (10 to 15 minims t.i.d.). Theelin in oil, given intramuscularly, and stilbestrol, given orally, were the estrogens employed, and in several instances they were given together to the same patient. Nausea and skin irritation following stilbestrol were observed in 1 case.

The average peak pulse rate on the first postoperative day was lower in the estrogen group and no crisis occurred in this group. One patient in the control group died; no deaths occurred in the estrogen group. Smaller doses of the estrogens are apparently as effective as are large doses. The preparations should be given for from four to seven days preoperatively, but should be continued beyond the first operation in multiple-stage procedures. Estrogens are apparently best indicated in the severe cases needing multiple-stage operations and in iodine-fast cases. No conclusions can be drawn as to the relative efficacy of theelin and stilbestrol.

FRED S. MODERN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Logie, J. W.: Mastopathia Cystica and Mammary Carcinoma. *Cancer Research*, 1942, 2: 394.

A brief review of the controversial literature on the relationship of cystic disease of the breast to carcinoma is presented. The author's concept of the morphology of mastopathia cystica includes the presence of dilated ducts accompanied by diffuse fibrosis. Papillary ingrowths into dilated ducts were found in 68 per cent, and glandular hyperplasia of the terminal ducts and acini in 62 per cent of the author's cases. The material for this study was obtained from 330 women with lesions of the breast which required operative removal.

Carcinoma was found in 118 specimens, while 212 were without carcinoma. In the latter group there were 82 instances of mastopathia cystica, the remainder revealing benign neoplasms, abscesses, and other lesions. Definite evidence of coexisting mastopathia cystica was found in 56 per cent of the 118 breasts removed for carcinoma. In 16 cases the carcinoma appeared to be arising in the area of mastopathia cystica.

Since carcinoma of the breast and mastopathia cystica are both relatively common conditions, the possibility of their chance coincidence must be considered. A four-fold table of data was arranged and the X^2 test was applied to the 330 specimens examined. The value of X^2 was found to be 10.029. This value indicates that the chance of getting the stated results, if mastopathia cystica and carcinoma are independent, are 1 in 1,000. Since the normal range of probability by this test is 1 to 5 in 100, it is obvious that the association of the two conditions is highly significant.

In any case in which the diagnosis of mastopathia cystica is established, a careful clinical follow-up is essential. If any change in the character of the lesion develops, histological study of its nature should be made. JOHN L. LINDQUIST, M.D.

White, W. C.: Skin Removal in Radical Mastectomy. *Ann. Surg.*, 1942, 115: 1182.

As this author sees it, the "Halsted school" believes that cancer spreads by permeation in the cutis, and that, therefore, a "wide" portion of the skin must be removed. Secondly, there is a school of thought which believes that this is not going far enough, as the spread peripheral to the excised skin is in the tissue immediately beneath the cutis. Therefore, such careful dissection of the skin must be made as to leave no fat attached to the under surface of the skin. And thirdly, there is the Handley belief that cancer spreads in the deep subcutaneous tissue, so that when the skin or immediate subcutaneous tissue is involved it is due to involvement of vertical lymphatics from the deep tissue.

For his study the author has taken the records of the cancers of the breast that have been subjected to radical mastectomy at the Roosevelt Hospital in New York in the period from January 1, 1922, to December 31, 1936. All cases of patients that had a recurrence in less than five years and later were included. All cases of those who were well and free from the disease but died in less than five years were excluded.

This report covers 254 cases, 238 with plastic skin closure and 17 with skin grafts. Of the 238 with plastic skin closures, 137 had proved axillary metastases and of the latter, 43 had local recurrences, including 3 parasternal nodule recurrences (31.5 per cent); 101 had no axillary involvement on pathological examination. Eleven of the latter had local recurrences, including 4 parasternal nodule recurrences (10.8 per cent). Of the 17 skin-graft cases, 14 had axillary metastases, with 5 local recurrences (35.7 per cent), while 3 had no axillary metastases, with 1 local recurrence (33 per cent).

The author, together with his associates, believes that the plastic closure was preferable to the skin graft if it did no harm to the patient. He insists on removal of at least 15 cm. of skin at the narrowest diameter, and often more if the growth is large. By liberal undercutting, it is usually possible to approximate the skin without undue tension, but in the patient with small breasts this may not be feasible. On the contrary, it is easy to close skin edges primarily in large breasts, even though a diameter of 25 or 30 cm. has been removed.

The author emphasizes the fact that in the cases with local recurrence death was not caused by the local recurrence but by the cancer metastases outside of the operative field. Furthermore, in the late skin recurrences, he was impressed by the simultaneous appearance of evidence of cancer outside of the operative field. For this reason he came to the conclusion that he had not lost any patient because he failed to make a wider excision of skin.

The author believes that the "skin graft school" has taken an empirical attitude not as yet supported by results. J. DANIEL WILLEMS, M.D.

TRACHEA, LUNGS, AND PLEURA

Birnbaum, G. L., and Thompson, S. A.: Resuscitation in Advanced Asphyxia. *J. Am. M. Ass.*, 1942, 118: 1364.

The findings of the authors support the view that manual artificial respiration must be instituted early to effect resuscitation when the respiration has ceased. However, manual artificial respiration was effective in a few instances after a longer period of time following cessation of respiration than the critical period of Lougheed, Janes, and Hall. Likewise, resuscitation with rhythmic insufflation of

oxygen was possible after a longer period following the cessation of respiration. Rhythmic inflation and suction of oxygen was by far the most effective of the methods, and at very much longer periods after cessation of respiration. ANTHONY F. SAVA, M.D.

Benavente Garcés, R.: Preoperative Pneumothorax in the treatment of Hydatid Cysts of the Lung. Arce's Method (Contribucion al tratamiento de los quistes hidatidicos pulmonares con pneumotorax preoperatorio. Método de Arce). *Rev. méd. Chile*, 1942, 70: 344.

Pneumocystotomy can be performed on the free or excluded pleura. Only noninfected cases should be submitted to surgical procedures which open the pleural cavity during the intervention; the acute pneumothorax is, however, a frequent cause of traumatopnea and shock. Infected cases should have the pleural cavity excluded previously; but the pleuropulmonary symphysis is seldom complete and, therefore, really serving its preventive purpose. Better results have been obtained by a preoperative pneumothorax.

The first step is a thorough x-ray examination in order to detect the exact location of the lesion. From 300 to 500 cc. of nitrogen are thereafter injected in the pleural cavity. Another picture is taken two days later, immediately followed by the injection of another 500 to 700 cc. of nitrogen. A third picture is taken two days later. The preoperative pneumothorax is completed with the injection of from 700 to 1000 cc. of nitrogen. A final picture is taken in order to detect the location of the lesion after completion of the pneumothorax. A comparison between the initial and the last roentgenograms reveals the exact location of the cyst. Intrapulmonary cysts of the upper lobe retract toward the hilus. Those of the lower lobe do not retract because their weight opposes the elevation of the lung by the pneumothorax. A retraction becomes evident only in Trendelenburg's position.

Preoperative pneumothorax has the distinct advantage of preventing any mechanical or vasomotor accidents which may happen during the opening of the pleural cavity and of reducing to a minimum the danger of surgical shock. The operation can be performed on a free pleural cavity; in most of his cases the author has closed—after evacuation—the cavity of the hydatid cyst with a simple or crossed suture, invaginating the edges of the adventitia.

Also the postoperative course has markedly improved because the stimulation of the natural defenses prevents an infection of the pleura even when the pneumothorax is not discontinued after the operation. EMANUELE MOMIGLIANO, M.D.

HEART AND PERICARDIUM

McComb, A. R.: Wounds of the Heart. *South. Surgeon*, 1942, 11: 432.

The first suture of the human heart was described by Cappelen in 1895. The second attempt was made by Farina in Rome in March, 1896. The third case was reported by Rehn of Frankfort on September 9, 1896. Since that time there have appeared in the literature increasing numbers of cases of successful suture of penetrating wounds of the heart.

Wounds of the heart which lend themselves to surgical operations are restricted to injuries inflicted by an instrument that will not cause large wounds of the cardiac wall. These wounds are produced by knives, ice picks, and firearms of small caliber. By far the most frequent site of the wounds is the right ventricle which is situated most superficially and therefore easiest of surgical access. The wound of entrance is usually small and does not allow much escape of blood from the pericardial sac. A wound penetrating the cardiac wall with penetration of one of its chambers will bring forth a forceful gush of blood from the wound with each systolic contraction of the heart. This forceful expulsion of blood into a fairly nonelastic sac, the pericardium, results in a rapid accumulation of blood within the pericardial sac with encroachment on the space allowed for the diastole of the heart and on the venae cavae, the result being that the venous return is rapidly and progressively reduced. Since the pressure in the thoracic portion of the venae cavae is negligible, the increase of intrapericardial pressure due to rapid accumulation of blood abruptly stops the venus return to the heart. The intrapericardial pressure must be overcome by an ever-increasing compensatory rise of venous pressure in order to maintain the return flow of blood to the heart. This compensatory mechanism carries on until the venous and arterial pressures become equal, at which time the heart is stopped. With this impairment of circulation there occurs anemia of the brain and rapid congestion of the veins, and death may follow. The surgical problem involved is threefold: namely, pericardiotomy with the release of the cardiac tamponade; second, closure of the wound and hemostasis, and, third, the general principle of the prevention of infection.

The physical findings warrant prompt diagnosis or they stimulate enough suspicion to justify exploration. The patient may be unconscious or he may appear only in mild shock. The skin is pale, moist, and cold with moderate cyanosis. The veins in the neck are markedly distended and beaded and there may be distention of other peripheral veins. The pulse may be weak, thready, irregular, and oftentimes imperceptible. The blood pressure is lowered and frequently cannot be determined at all. The venous pressure is increased because of intrapericardial pressure and has been as high as 400 millimeters of water. The heart sounds are weak and often not heard. There may be heart irregularity. Air may escape from the pleural sac into the pericardial sac and one may hear a churning and slapping sound with each heart beat. Aspiration of the pericardium is a valuable aid in diagnosis.

The preliminary treatment consists in putting the patient in the Trendelenburg position, giving mor-

phine and atrophine, and, in addition, if the patient is in profound collapse, giving 5 minims of adrenalin hydrochloride hypodermically. Venoclysis fluid may be administered slowly. Operation should be performed at once. This may frequently be done under local anesthesia. Sometimes this may be supplemented with general anesthesia as the patient's condition improves after the tamponade is released. Numerous operative approaches to the heart have been devised. After exposure of the pericardium in any of these methods it is necessary to clamp and ligate all vessels, and to pay particular attention to the internal mammary vessels to prevent subsequent hemorrhage following the operation.

The wound in the pericardium gives the surgeon an idea as to the portion of the heart most likely to be involved, and the necessary ribs, costal cartilages, and segment of the sternum can be resected accordingly. The pericardium is then opened widely over the selected site, the pericardial sac aspirated, and the site of bleeding located as quickly as possible. Frequently bleeding can be controlled by pressure with the tip of the left index finger over the site of bleeding. With the tip of this finger held over this site, sutures may be placed in the myocardium beneath the finger in these areas and tied by the assistant. Care should be taken in so placing these sutures that they do not penetrate the endocardial lining and that they are not tied so tightly as to strangulate the myocardium. In large lacerations of the cardiac wall one may place sutures in the myocardium lateral to the wound with the left index finger over the opening to prevent further hemorrhage. After a lateral suture is placed on either side, the sutures are crossed over and held by the assistant, which brings the wound together and causes the bleeding to stop. Following this procedure the surgeon may leisurely place his sutures for approximation.

Wounds of the base of the heart, posterior surface of the auricles, or great vessels are very difficult to suture. In such cases apex traction is often a life-saving measure. After hemostasis all blood should be carefully aspirated from the pericardial sac and the pericardium thoroughly irrigated with normal saline solution. The pericardium should then be loosely closed, the muscles and subcutaneous tissue approximated loosely with interrupted sutures, and the skin closed tightly. Drainage of the pericardium should be avoided whenever possible. Subsequent collection of fluid in the pericardial sac following operation can be aspirated with a needle. A secondary pericardiotomy should be done if the fluid cannot be withdrawn otherwise.

The postoperative treatment consists of absolute rest in bed with adequate quantities of morphine and an oxygen tent if possible. Stimulants should be avoided. Anemia should be combated immediately by repeated small transfusions of from 250 to 350 cc. of blood, given preferably by the citrate method at a very slow rate so as not to cause an increase in the blood pressure.

The chances for recovery of patients with wounds of the heart treated by operation are said to be from 50 to 73 per cent. J. DANIEL WILLEMS, M.D.

McQuarrie, I.: Impaired Ability to Fabricate Serum Proteins as the Chief Cause of Edema in Chronic Constrictive Pericarditis. *J. Lancet*, 1942, 62: 199.

Edema resulting from a hypoproteinemia which in turn has apparently been caused by an inability of the body to fabricate serum proteins has been investigated by various workers in the past. McQuarrie and his coworkers reported a case in which inability to manufacture serum proteins resulted from an unusual type of noninflammatory atrophy or aplasia of the liver lobules. Other authors have reported a similar state resulting from advanced hepatic cirrhosis, and Pick's syndrome.

In the present article, McQuarrie summarizes a case in which there was chronic pericarditis with secondary congestive hepatic disease, ascites, and edema, with an associated hypoproteinemia of severe grade. In this case, however, ability to produce serum proteins followed the surgical procedure of pericardiolysis, with complete disappearance of the edema.

The case presented is that of an eight-year-old boy who developed a bizarre illness covering a period of eighteen months and characterized by low-grade fever, moderate enlargement of the spleen and liver, and mild secondary anemia. Examination of the heart showed a questionable small pericardial effusion. X-ray examination of the chest showed evidence of pulmonary congestion. Later, a moderate degree of edema, ascites, and hydrothorax developed. The urinalysis and renal function tests were normal. However, during a six months' period, repeated serum-protein determinations revealed a low albumin fraction (between 1.77 and 2.97 per cent), and a low globulin fraction (between 0.95 and 2.2 per cent). These low serum-protein values persisted in spite of high protein intake, repeated blood transfusions, and the lack of loss of proteins through the urine or ascitic fluid.

During the next two years the patient was kept at home and his condition gradually became worse. The edema and ascites became pronounced. Finally, the patient was readmitted to the hospital, and many laboratory investigations were carried out. Because of a greatly increased venous pressure, a markedly increased circulation time, and kymographic and fluoroscopic evidence of a decreased pulsation of the heart, a diagnosis of chronic constrictive pericarditis with secondary atrophy and cirrhosis of the liver and secondary hypogenesis of serum protein was made.

Approximately five years after the onset of the illness, a pericardiolysis was performed. Within a month after operation the edema entirely disappeared, and the serum proteins returned to normal levels and stayed there (albumin from 3.4 to 4.3 per cent; globulin from 2.7 to 3.4 per cent). The ascites gradually cleared up subsequently and never recur-

red. The venous pressure remained high for some time after the operation but, in spite of this, the edema and ascites cleared up.

The author concludes that the hypoproteinemia played the dominant role in the production of ascites and edema in this case. This hypoproteinemia was the result of the chronic passive congestion of the liver and cellular changes associated therewith (resulting from the constrictive pericarditis). That this was the mechanism responsible for the failure of serum-protein regeneration was shown by the fact that this function was restored after the congestion had been relieved by pericardiolysis.

LUTHER H. WOLFF, M.D.

ESOPHAGUS AND MEDIASTINUM

Drash, E. C., and Woodward, F. D.: The Treatment of Impenetrable Esophageal Strictures by a Combined Intraesophageal and Extraesophageal Approach. *Surgery*, 1942, 11: 886.

A report of 3 cases of esophageal stricture treated by a combination of external and internal approach forms the basis of this article. A discussion of the etiological factors in the development of stricture and the usual method of treatment of earlier cases is also discussed. After having had experience with several cases of foreign body of the esophagus in which removal through the esophagoscope alone was difficult and in which a combination of external and internal approach had been used, a method for the relief of stricture was hit upon.

The first case was that of a twelve-year-old negro boy who had swallowed lye two weeks before admission. A stricture 2 cm. in length was demonstrated with the x-rays. After a gastrostomy was performed an attempt at passage of a bougie through the stricture was unsuccessful; an incision was then made at the base of the neck to expose the lower cervical esophagus. By manipulation of the bougie within the esophagus and manually from without, the stricture was dilated sufficiently to allow the passage of the bougie. After dusting the cervical wound with sulfonamide, it was closed with drainage. Dilatation of the stricture could then be carried out in the usual manner and the lumen remained patent.

A second case of spasm of the cricopharyngeus muscle in a seventy-three-year-old white woman was treated in a similar manner after a prolonged attempt at passing the bougie in the usual manner was unsuccessful. Exposure of the esophagus through a low cervical incision resulted in the passage of a bougie by means of external manipulation. Healing of the wound occurred without complications.

A third case of multiple lye burns of the esophagus of eleven years' duration in a twenty-seven-year-old woman was presented; all attempts at dilatation even with a combination of internal and external approach had failed. The author suggests that transthoracic esophagostomy and dealing with the strictures individually through the thorax by passage of a bougie up through the stomach and down through the mouth, combined with external manipulation, have much to offer in this type of stricture.

WILLIAM E. ADAMS, M.D.

Churchill, E. D., and Sweet, R. H.: Transthoracic Resection of Tumors of the Esophagus and Stomach. *Ann. Surg.*, 1942, 115: 897.

The classical division of the esophagus has always been into thirds. From the standpoint of the site of occurrence of tumors and from the point of view of surgical management it is more useful to divide it into fourths. The second and third fourths are to be thought of as the middle half (Fig. 1).

In the treatment for carcinoma of the esophagus several significant pathological findings have been recognized.

1. The majority of carcinomas are epidermoid in character. In rare cases adenocarcinoma may arise from gastric mucosa in the lower portion of the esophagus.
2. The tumors often spread in the submucous and muscular coats for a distance of several centimeters, detectable only on microscopic examination.
3. Metastases to the lymph nodes below the diaphragm are frequent.
4. Metastases to the liver occur late in the disease.
5. Metastases to the lung should be looked for because venous return from the high gastric and esophageal areas enters the caval system directly instead of passing first through the portal system.

Operability is determined by several factors. A constant boring pain in the interscapular region of the back, persistent fever, and masses on the "rectal shelf" are usually an indication of inoperability. Endoscopic examination determines the level of the lesion and affords an opportunity for biopsy. The roentgenological examination when properly done is of more value than any other diagnostic procedure.

Preoperative preparation of the patient consists of eradication of oral sepsis, and the administration of a high vitamin, high protein, and high carbohydrate diet. Transfusions and intravenous fluids are administered as needed. Artificial pneumothorax is not done before surgery is undertaken.

In the management of lesions in the middle half, jejunostomy or gastrostomy with exploration of the upper abdomen is done as the first operation. The Beck-Jianu gastrostomy is recommended. After recovery from this first operation is complete, esophagectomy is done through the left pleural cavity. The esophageal stoma is brought out through an incision in the neck and the distal end of the esophagus is closed. A third phase of the operation is the establishment of a passageway from the esophageal stoma to the gastrostomy opening by means of a skin-lined tunnel.

Twenty-one patients with carcinoma of the mid-portion of the thoracic esophagus were selected from a larger group as favorable for operation. Only 9 were free from visible metastases. In 8 of these thoracotomy was done; 2 were found to be inoperable. Of the 6 subjected to esophagectomy, 5 sur-

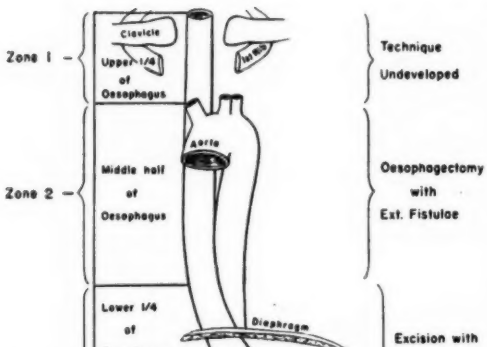

Fig. 1. The arbitrary division of the thoracic portion of the esophagus and the cardiac region of the stomach into zones so as to facilitate the understanding of the technical problems involved in the surgical management of carcinoma arising in these several areas. (Courtesy of J. B. Lippincott Co.)

vived. Three of these are living and well, the other 2 died—one from metastases and the other from pneumonia.

The management of lesions of the lower fourth of the thoracic esophagus and cardiac end of the stomach requires adequate preoperative attention to the nutrition, hydration, and general well-being of the patient. Through a left thoracotomy incision the diaphragm is exposed and incised. Exploration is done, and if further surgery is advisable, resection of the tumor-bearing section is done. An accurate anastomosis is necessary—especially union of the mucosa. A total of 21 patients with lesions in this area were explored by the transthoracic route. In 1 of these no tumor was found. In 4 cases of carcinoma of the cardiac end of the stomach the growth was found to be inoperable. One of these patients remained in the hospital for terminal care and died four weeks after the operation. The other 3 were discharged from two to three weeks after exploration. In a sixth case a two-stage transthoracic total gastrectomy was attempted, but the lesion was found to be inoperable at the second stage. There were 2 cases, one of neurofibroma and the other of fibrosarcoma of the fundus of the stomach, treated by local excision of the tumor through the transthoracic route. In the remaining 13 cases of carcinoma resection was done. In 2 of these a total gastrectomy with an esophagojejunal anastomosis in the thorax was done. Both patients died, one because of leakage at the suture line, the other of widespread sepsis from soiling at operation but with an intact suture line. In the remaining 11 cases a resection and esophagogastric anastomosis were performed. In 3 of these cases the growth was in the lower end of the esophagus; in 8 it was in the stomach. There was 1 postoperative death from auricular flutter. Ten patients survived the operation. Two of these have died of recurrent disease. All of the remainder are well and free from symptoms for from three months to two and one-half years after the operation. These results may be said to compare favorably with those from resections for carcinoma in other locations in the stomach.

D. B. Phemister reported 12 cases in which resection was performed with 8 immediate survivals. In 5 cases the carcinoma was in the middle half of the esophagus, and the tumor was removed through the left chest and neck. Four patients survived the operation; 1 died after four or five days of infection. Two patients subsequently died of recurrences. Two are still free from recurrence, 1 for over three months and 1 for sixteen months. In 7 patients the carcinoma was located lower down, in 3 in the esophagus, and in 4 in the proximal stomach. Resection was performed, followed by anastomosis. Four patients survived the immediate operation. One died of leakage and infection at the end of a week, 1 of fibrillation and heart failure, and 1 of pneumonia and mediastinitis, without leakage. Three patients are alive and apparently free from recurrence, 1 for nine months, 1 for fourteen months, and 1 for four and one-quarter years. The latter had carcinoma of the lower esophagus with metastases to the lymph nodes in the upper portion of the lesser curvature. This case demonstrates that metastases in this region are not necessarily a contraindication to operation. The 12 cases were operated upon in one stage, with 1 exception in which a preliminary gastrostomy was performed. The routine should be a one-stage operation through the left chest. In the stomach cases, when the resection is extensive, there may be difficulty of approximation for anastomosis. In 1 such case it was necessary to incise the peritoneum alongside the duodenum and mobilize it so that anastomosis could be accomplished.

MANUEL E. LICHTENSTEIN, M.D.

Phemister, D. B.: Experiences with 8 Cases of Resection of the Esophagus for Carcinoma. *J. Thorac. Surg.*, 1942, 11: 484.

Eight resections of the esophagus for carcinoma in 7 males and 1 female are reported. The tumor was primary in the esophagus in 6, and in the cardia in 2 cases. The patients ranged from forty-six to sixty-four years of age. Of the 6 patients with primary esophageal tumors 4 survived—a mortality of 33⅓ per cent. Of the remaining 2, 1 survived.

Two types of operations were done—resection with esophagogastrostomy in 4, and resection with cervical esophagostomy in 4. In the first 4 cases, 2

of the cancers were primary in the stomach and 2 were in the lower esophagus; 1 of each of the 2 patients survived. Of the 4 patients who underwent resection with cervical esophagostomy, 3 survived.

Factors of importance in the management of the cases were as follows:

1. A preliminary blood transfusion is indicated if any considerable degree of anemia exists; also blood transfusion during the operation.

2. The approach was through the eighth or ninth rib bed for resection and esophagogastrostomy, and through the seventh rib bed with division of the fifth and sixth ribs posteriorly for resection of the entire thoracic esophagus.

3. Ethylene-oxygen mask anesthesia under from 4 to 6 mm. of mercury pressure was employed. The pleural space was obliterated by aspiration of residual air through a stab-wound Pezzer-catheter drain.

4. The diaphragm was paralyzed by crushing the phrenic nerve in those cases in which an esophagogastrostomy was made.

5. The lung was elevated by a special retractor.

6. Lymph nodes along the lesser curvature, as well as other neighboring lymph nodes, were removed with the primary tumor.

7. Removal of the spleen in cases of carcinoma of the cardia facilitated the making of the esophagogastrostomy.

8. Two rows of interrupted linen sutures were employed for making the anastomosis and tension on the suture line was carefully avoided.

The late results of esophagogastrostomy: 1 patient well and without evidence of recurrence in May, 1942, four years and three months after operation; and another patient was well for fifteen months at the same date.

The late results of cervical esophagostomy: 1 patient dead of recurrence or metastases after ten months, and another after fourteen months; the third patient was well and free of recurrence in May, 1942, seventeen months after operation.

WILLIAM E. ADAMS, M.D.

MISCELLANEOUS

Alexander, J.: Circumscribed Intrathoracic Neoplasms. *J. Am. M. Ass.*, 1942, 119: 395.

Contrary to the prevailing impression, the majority of circumscribed intrathoracic neoplasms are intrapulmonary and malignant. Many circumscribed extrapulmonary neoplasms are malignant, and those that are benign may undergo malignant degeneration or cause disability or serious complications as a result of increase in size.

Except for those bronchogenic and esophageal carcinomas that yield endoscopic biopsy material, and those neoplasms that have metastasized, a determination of malignancy or benignancy cannot be made with reasonable accuracy. Needle aspiration biopsy is not advised unless the patient's general condition is so poor that operation would not be performed unless the tumor was known to be malignant. Since delay in removal of malignant neoplasms may result in their becoming inoperable and since benign neoplasms are potentially dangerous, all presumably removable neoplasms should be promptly operated on, even though they may be giving no troublesome symptoms.

The only proper use of high voltage roentgen therapy is as a therapeutic test for lymphoblastoma or for palliation in inoperable malignant neoplasms. The use of roentgen therapy for other purposes is useless, and, because of the loss of valuable time in those cases that happen to be malignant, dangerous.

SAMUEL KAHN, M.D.

Kent, E. M., and Blades, B.: Experimental Observations Upon Certain Intracranial Complications of Particular Interest to the Thoracic Surgeon. *J. Thoracic Surg.*, 1942, 11: 434.

The role of intrathoracic infection as a cause of brain abscess has long been recognized. The literature includes many reviews of this problem and the important observations may be summarized as follows:

This complication may follow intrathoracic suppuration whether it be intrapulmonary (chiefly bronchiectasis and pulmonary abscess) or extrapulmonary (empyema thoracis). The relative incidence of brain abscess as a complication of empyema is considerably lower than that in bronchiectasis and pulmonary abscess; furthermore, an unknown proportion of cases of empyema are associated with intrapulmonary infection. Practically all cases of empyema which result in brain abscess must fall into the latter group. The metastatic lesion in the brain is multiple in a large percentage of these complications, and the magnitude of the problem is thereby increased and the therapeutic outcome unfavorably affected. The cerebrum is usually the site of these abscesses, the cerebellum but rarely so.

The explanation of the leading role played by intrathoracic suppuration in the formation of hematogenous brain abscess has been based upon anatomical considerations, namely, that infection within the lung may gain uninterrupted access to the arterial circulation by way of the pulmonary venous system while a focus of infection elsewhere in the body must usually metastasize to the arterial tree by way of the venous return and the filterlike pattern of the pulmonary vascular bed. This analysis has not indicated, however, any reason why the brain should be so predominantly affected. Nevertheless, it is true that metastatic abscesses consequent upon intrathoracic suppuration are rarely found in organs other than the brain and that it is still more unusual to encounter multiple systemic abscesses.

The authors have further studied the problem experimentally, guided along two lines of endeavor: (1) an effort has been made to find factors which may contribute to the predominant position of cerebral metastatic abscess as a complication of pulmonary disease, and (2) an effort has been made to produce experimental brain abscess by the use of putrid puru-

lent material of mixed flora secured from patients suffering from postoperative pleuropulmonary infection. Based on this work, they arrived at the following conclusions:

1. The experimental production of hematogenous brain abscess is difficult in the dog.

2. Metastatic abscess attendant upon intrathoracic suppuration occurs almost exclusively in the brain, rarely in other organs. The explanation of this observation is not entirely clear although the work of McCordock is significant. He believes that the brain is the site of metastatic abscess formation as a complication of pulmonary suppuration because the brain tissue offers a more favorable culture medium for the spirochetal and fusiform groups of organisms commonly found under these circumstances. A possible explanation offered by the authors of this article is that the capillaries of the brain may be smaller in diameter than those in other organs, and thus contribute to the production of metastatic brain abscess by virtue of finer filtering action. However, they admit that confirmation by improved techniques is required.

3. Air injected into the peripheral venous channels does not pass through the capillary beds of the lungs in emboli of sufficient size to be seen and probably does not do so at all. Massive quantities of air are required to cause death when introduced by this route and then the mechanism is extensive obstruction of the pulmonary vascular channels with resulting asphyxia. The heart fails first under these circumstances.

4. Air injected into a pulmonary vein gains immediate access to the left side of the heart and to the arterial system. Very small amounts (1 cc.) so introduced in the dog are uniformly fatal, and death results solely from coronary-artery obstruction.

5. The position of the experimental animal did not prevent fatal coronary occlusion by air emboli. Neither did the position of the dog prevent cerebral air emboli.

6. Air injected directly into the carotid artery was not fatal and could not be shown to produce cerebral symptoms or microscopic evidence of changes in the brain.

7. Ventricular fibrillation caused death when air emboli reached the left ventricle. All measures of resuscitation failed, and efforts to defibrillate the heart were to no avail.

8. Emboli attending intrathoracic surgical procedures must traverse a pulmonary vein to produce clinical manifestations of serious import. When lobectomy or pneumonectomy is performed, primary ligation of the associated pulmonary vein or veins affords the greatest protection against these complications.

SAMUEL H. KLEIN, M.D.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Levy, J. S., and Smith, R. T.: Trichobezoar. Report of a Case. *Am. J. Digest. Dis.*, 1942, 9: 198.

The authors present an interesting case of trichobezoar or phytobezoar in which the mass not only filled the stomach but extended through the pylorus, filled the entire duodenum, and extended into the jejunum. The mass was palpated in the upper abdomen on physical examination. The history revealed that the patient admitted swallowing hair and snuff during each of her three pregnancies but not at other times. Her oldest child was two and one-half years old. Certain features of the mental picture suggested those usually found in pellagra.

The administration of thiamine chloride and nicotinic acid resulted in a very prompt clearing up of the confused and slightly disoriented mental state of the patient within a few days.

At operation when the stomach had been emptied of its hair ball, a definite ulcer of the anterior wall of the stomach which had perforated and adhered to the abdominal wall was found.

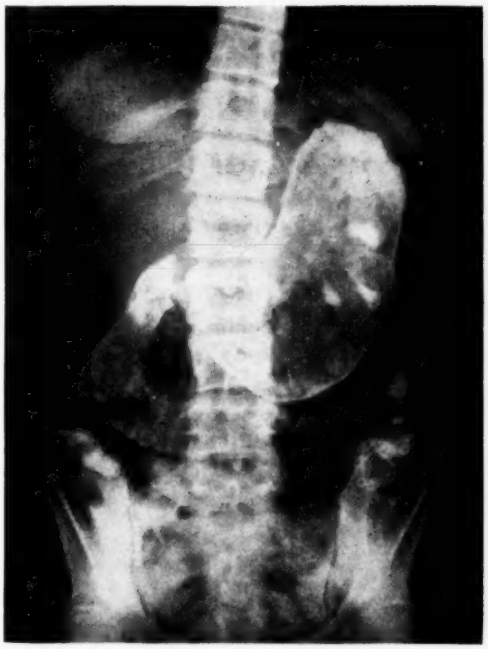

Fig. 1. Six-hour film showing the barium-outlined mass in stomach, duodenum, and jejunum.

Fig. 2. The trichobezoar after its removal from the stomach and duodenum. The small part which extended into the jejunum has shriveled up in drying.

Including the case herein reported, 6 of 16 cases of ulceration associated with trichobezoar have perforated.

Contamination of the peritoneal cavity was prevented by adherence to the anterior abdominal wall. This apparently is the only case thus far reported in which the bezoar extended as a continuous mass from the stomach into the jejunum. The vitamin deficiency was probably the result of interference with digestion by this large mass in addition to the marginal diet which the patient followed.

HAROLD LAUFMAN, M.D.

Bowers, R. E.: The Surgical Treatment of Carcinoma of the Stomach in Aged Individuals. *Surgery*, 1942, 11: 869.

Carcinoma in the aged individual exhibits a slower growth of the original tumor, a less rapid advance of the metastatic lesion, and therefore a longer course before the disease advances sufficiently to cause the death of the individual. Consequently, the aged have a better chance for a permanent cure, or at least a more prolonged palliation, than have younger people. Tables are advanced by Bowers showing that the mortality rate of resected cases in persons over sixty years of age is 9 per cent, and the mortality of palliative gastroenterostomy is not only higher but the procedure is notably unsuccessful in relieving the patient.

The present low mortality rate is accredited to the newer methods of treating these cases and the com-

plications common to them. Pneumonia is combated by the sulfonamides, while evisceration is safeguarded against by the use of silver wire for approximating the wound. Allowing the patient to be out of bed and walking in three or four days following operation has decidedly cut down the problem of postoperative embolism. It must be remembered that a carcinomatous stomach is an infected stomach, and the administration of sulfaguanidine or sulfadiazine previous to operation has resulted in a decided decrease in postoperative infections. Naturally, success in these cases depends upon early diagnosis. Any patient with the history of loss of appetite, aversion to food, loss of weight, and weakness must be suspected of gastrointestinal carcinoma until proved otherwise if early diagnosis is to be made. Utilization of every means available should be resorted to, but no single one should be considered conclusive.

The choice of anesthesia, once the condition has been discovered and operation decided upon, is restricted to local anesthesia or the open drop ether method.

The operative procedure that has given most success in the hands of the author has been Hofmeister's radical gastric resection. In 9 cases in which the course of treatment was as described are discussed in detail by Bowers, and it is concluded that operation not only can be safely performed in the aged with successful results, but can be performed with even a better prognosis than in the younger age groups. STEPHEN A. ZIEMAN, M.D.

Stein, J. J.: Gastrojejunocolic Fistula. *Am. J. Digest. Dis.*, 1942, 9: 192.

The etiological factors of gastrojejunocolic fistula are essentially the same as those of postoperative jejunal ulcer. The most important of these are hyperacidity, the application of tight intestinal clamps, the use of nonabsorbable suture material, improper postoperative care, and other errors in surgical technique, such as improper technique of gastrointestinal anastomosis, and the placing of sutures too close together in the mucosa.

At operation the distal loop of the jejunum is usually found to be dilated and the wall hypertrophied as a result of gastric juice and fecal material from the colon which are emptied into it. If the fistulous opening is large and a valvelike action is not effected by the jejunal mucosa, undigested food particles will pass through the colon. If a large degree of inflammation with subsequent scarring takes place in the colon, a low-grade obstruction may develop in the transverse colon.

The outstanding symptoms are persistent or intermittent diarrhea, marked loss of weight and strength, very little pain, and fecal eructations or vomiting.

It is emphasized that all cases should receive medical management for a few weeks, but that surgery must be resorted to without further delay if pain, diarrhea, or other symptoms persist. No routine method of surgical treatment can be stated as applicable to all cases. In the case reported, a high cecostomy was first performed, apparently to shunt the fecal stream. The patient gained 40 lb. in forty days, and was then explored through a left upper rectus incision. The fistulous tract was completely excised and the openings in the colon, jejunum, and stomach were closed. An anterior gastroenterostomy was then done. As a final stage the cecostomy was closed.

The convalescence was entirely uneventful. The author believes that the patient could not have survived a more formidable procedure, especially if the preliminary cecostomy had not been done.

The anterior gastroenterostomy was performed in this case because of a large degree of duodenal scarring, because it was technically easier and faster to do, and because a much simpler surgical problem would be encountered if a gastrojejunal ulcer occurred later. If the stomach is partially resected an antecolic anastomosis should be done between the jejunum and stomach because it is simpler to repair a recurrent gastrojejunal ulcer following anterior anastomosis than following a subtotal gastrectomy with a posterior anastomosis.

The author believes that if interrupted stage operations are resorted to in the repair of this lesion, the operative mortality will be considerably reduced.

HAROLD LAUFMAN, M.D.

Uriburu, J. V., Jr.: The Treatment of Intestinal Occlusion by Intubation and Aspiration. Indications, Technique, and Accidents. (Tratamiento de la oclusión intestinal mediante la intubación y aspiración. Indicaciónes. Técnica. Accidentes.) *Dia méd.*, B. Air., 1942, 14: 282.

The author reviews the different types of intestinal occlusion, and on the basis of the pathological classification, Wangensteen's classification, and the conceptions of Willson, as well as the results of his own experience, he presents the following simplified diagram regarding the indications for treatment by intubation and aspiration.

INDICATIONS FOR ASPIRATION

I. Occlusion of the small intestine
   A. Not associated with operation
      1. Paralytic or spastic ileus
      2. Early mechanical occlusion following inflammatory adhesions
   B. Associated with operation
      1. Before operation in all simple cases
      2. After any operation

      Aspiration is not recommended before operation for occlusions due to strangulation, particularly early operations.

II. Occlusion of the large intestine
   A. When the ileocecal valve is patent toward the ileus (same indications as for the small intestine)
   B. When the ileocecal valve is not patent toward the ileus, surgical treatment is always to be resorted to, and aspiration may be used after the operation

Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Fig. 1. Total coiling of the tube in the stomach.
Fig. 2. Tip of the tube sticking in the fundus, loop passing to the duodenum.
Fig. 3. Tube reaching obstacle, taking a retrograde turn and returning to the stomach.
Fig. 4. End of the catheter rolled into a ball in the intestinal lumen.

Subsequently the text describes the necessary instruments: simple catheters, Miller-Abbott's tube, double-lumen tubes, and Willson's tube. For adults the author prefers the last tube because of its larger lumen.

To start aspiration in the stomach, duodenum, and the first intestinal loops, the author uses a glass ampoule connected to the tube and to a rubber bulb on the aspiration side. As soon as the aspiration is normal he prefers the use of two bottles united by rubber tubing at different levels. An interesting detail is that, instead of filling the rubber balloon with a given volume of air, he measures the pressure with the Claude manometer and sets it at 10 cc. of water; in this way he can detect any loss of pressure of the balloon. Furthermore, the pressure remains constant while the balloon is emptied and filled up with air several times. This method also prevents any excess of pressure which might harm the intestine.

The difficulties, accidents, and defects of intubation and the ways to correct them, are generally shown by the x-rays.

The difficulties encountered during the introduction of the tube are:

1. Passing the tube through the nose. This happens especially with thick tubes. The author mentions an interesting case in which the tip of the catheter was stopped in the nasal cavity and a loop of the tube reached the stomach.

2. Passing the tube to the esophagus. The catheter rolls on itself in the pharynx; in this case it must be taken out and set in again.

3. Rupture of esophageal varicosities. This accident was reported by Johnston in SURGERY, GYNECOLOGY AND OBSTETRICS, 1940, 70: 365.

4. Passing the tube through the pylorus. This is sometimes caused by the coiling of the tube in the stomach (Fig. 1); at other times, especially when employing thin catheters as the Miller-Abbott's type, the author has observed the accident reported by Willson in which the extremity of the tip of the tube stuck in the fundus and only a loop of it passed to the duodenum (Fig. 2).

5. Passing the tube through the angle of Treitz. To overcome this difficulty one must flatten the balloon as suggested by Willson and wait till the tip negotiates the obstacle.

6. Passing the tube through abnormal narrowings (adhesions, the vicinity of an enterostomy). The author mentions 2 cases in which the catheter reached the obstacle, took a retrograde turn, and returned to the stomach (Fig. 3). In some unfortunate cases these accidents oblige the operator to stop the process.

7. Lack of progress due to coiling up of the tube in the stomach. To overcome this the tube must be introduced very slowly. Once it has happened, it can be obviated by removing some length of the catheter.

8. Lack of progress due to the balloon becoming broken. If the loss of air measured with the manometer is very little, the pressure can be kept up by injecting more air at intervals. If the leak is important and progress stops, the catheter must be taken out.

The difficulties during the functioning of the catheter are:

1. Obstruction of the catheter. It should be washed out by the injection of water.

2. Coiling of the distal end of the catheter. Zavaleta has published an observation of this rare occurrence. The end of the catheter was rolled into a ball in the intestinal lumen (Fig. 4). Pulling some length of the tube out sufficed to correct this.

3. Rupture or leak of the balloon. As the catheter is functioning, this accident has no material importance.

4. Poor reaction of the patient in spite of the intubation. The author considers 2 possibilities:

a. If the tube functions correctly and there is an aggravation of the disease in spite of this, one must think of the possibility of an erroneous diagnosis (strangulation, or occlusion of the colon with closure

of the ileocecal valve). In case of doubt operation is imperative.

b. If there is no improvement of the condition and the case is one in which aspiration but not operation is permissible, the problem is a serious one. It may be a bad paralytic ileus, in which the tube does not progress because of the complete atony of the bowel, or a high plastic peritonitis, in which the adhesions hinder the passage of the tube. One could try enterostomy, but with little possibility of success.

All of these difficulties, defects, and accidents can be causes of failure of the method. Those attributable to the operator are due to erroneous diagnoses, lack of knowledge of the proper indications for the procedure, technical mistakes, and lack of the necessary vigilance during the procedure.

HECTOR MARINO, M.D.

Noer, R. J., and Johnston, C. G.: Small-Intestine Obstruction, A Five-Year Study. *Ann. Surg.*, 1942, 115: 935.

An analysis of the results over a period of five years was made in all cases of small-intestinal distention or obstruction treated at the Detroit Receiving Hospital on the Wayne University Surgical Service. The primary consideration was relief of distention by gastric, duodenal, or intestinal suction. In occluded ileus, operation was carried out within twenty-four hours when mesenteric vascular interference was suspected, or when the cases were seen early before marked distention had developed. All other cases were subjected to a period of preparatory decompression with concurrent restoration of fluid and electrolytes. Nonoccluded cases required only decompression, fluid, and electrolytes and treatment of the primary disease condition which caused the distention. There was a total of 332 cases treated for small-intestinal obstruction with or without distention. In the 112 cases due to lumenal occlusion there were 21 deaths. In the 135 cases of distention without occlusion, cases of "paralytic ileus," there were 25 deaths. In this group there were 47 cases of postoperative ileus, 54 associated with peritonitis, 12 cases due to trauma, and 22 due to nonintestinal diseases such as pneumonia, uremia, pancreatitis, and liver abscess.

There were 29 cases of an undetermined or mixed type. In 5 of these suction drainage relieved the distention and recovery ensued. Studies subsequently failed to establish the cause of the distention. In the other 24 cases adhesions and inflammation or malignancy and inflammation were responsible. There were 12 deaths, most of them in the group of 24 cases. There were 81 cases in which there was interference with the blood supply. Internal strangulation occurred in 25 cases; 7 were due to adhesions, 12 to volvulus, 4 to internal hernias, and 1 to intussusception. There were 10 deaths in this group. There were 56 cases with strangulation of external hernias. Four required resection of the intestine. Three of these patients died. There were 5 other deaths in this group. In the whole series of 332 cases there were 76 deaths, a mortality rate of approximately 20 per cent.

In the discussion WHIPPLE stated that preliminary decompression with suction drainage of the small intestine has made right hemicolectomy a safe procedure with but 1 death in 39 cases. Ileus frequently results from a low serum protein and also from edema of the intestinal wall due to overhydration and use of excessive salt. MANUEL E. LICHTENSTEIN, M.D.

Hurst, Sir A., Ogilvie, W. H., and Simpson, C. K.: Traumatic Duodenal Ulcer; Repeated Hematemesis from Postoperative Hemorrhagic Gastritis. *Guy's Hosp. Rep.*, Lond., 1942, 91: 61.

The authors report a case of peptic ulcer which developed immediately after the patient was kicked in the epigastrium by a horse. Other cases developing symptoms of a duodenal ulcer following a local injury have been reported by Chalier and Desjacques and Stewart.

In 1915, a few hours after being kicked in the epigastrium by a horse, the patient developed a severe abdominal pain and commenced vomiting. One month later he underwent an appendectomy because of continuous pain and vomiting after every meal. Symptoms recurred and were only partially controlled by a milk diet. Four months after the initial injury a gastroenterostomy was performed. At operation the pylorus was found constricted by a healed ulcer. During the ensuing eight years the patient suffered from recurrent attacks of pain and diarrhea which at times were sufficient to interfere with his work as a metallurgist. In 1923, eight years after the initial injury, he had a severe hematemesis, which recurred again two years later. At this time a partial gastric resection was done. One year later he again had a gastric hemorrhage which recurred in six months. During the next three years he had three more severe hemorrhages.

On admission to the hospital, studies showed the stomach to empty rapidly but with a back-flow as far as the duodenal bulb. The red corpuscles numbered 4,050,000 and the hemoglobin measured 72 per cent; the stools contained no occult blood but there was a marked hyperchlorhydria.

At operation it was found that the greater part of the stomach remained. No ulcer could be felt either in the stomach or at the site of the anastomosis. The gastroenterostomy was torn down and a high Polyn-Moynihan gastrectomy performed. Recovery was uneventful.

Gastric analysis showed a complete achlorhydria. A ten-year follow-up report states that the patient is still careful about his diet and that instead of eating large meals he has to eat several small ones daily; any indigestion and flatulence is controlled by hydrochloric acid. He also states, "I feel better now than at any time since 1915, when the trouble first started, and my routine of living differs little from that of a man with a normal stomach."

The pathological report states that the lesions appear to be limited to the mucous membrane, no

scarring or deep necrosis being evident. The entire mucosa is edematous, hyperemic, and irregularly flecked with petechial hemorrhages. Under a thin tenacious film of mucous are numerous irregular patches of exudate which when removed expose superficial erosions. In the regions of the lesser curvature and at the site of the anastomosis, these erosions become confluent. The histological features are typical of hemorrhagic erosive lesions and consist of gross hyperemia and intense serocellular infiltration of the mucosa; the erosions extend across the openings of the gastric glands and form the exudate described. There is marked lymphocytic infiltration in the deeper mucosa. These changes are sharply demarcated from the muscularis mucosae.

ALFRED B. LONGACRE, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Owen, C. A.: Plasma Prothrombin. An Index of Liver Function. *Harper Hosp. Bull.*, Detr., 1942, 1: 113.

The maintenance of a constant prothrombin level in the blood as one of the important functions of the liver has been well established both by experimental observation and the increasing clinical use of tests for prothrombin. With the discovery of Vitamin K, it was soon found that this vitamin could correct hypoprothrombinemia only if the liver was not diseased. When a liver is enlarged and nodular, and there are ascites and venous dilatation, no laboratory test is needed to confirm the diagnosis of cirrhosis, but in cases in which there are complex symptoms and findings the degree of damage is difficult to interpret and a clinical diagnosis is impossible. The next test of liver function, if one is to be added to the large number already extant, must present evidence of increased sensitivity and reliability.

The author has presented in detail 20 cases in which quantitative prothrombin analyses are correlated with clinical findings. In these cases the test seems to aid in the diagnosis, and to have prognostic significance. Patients used in this study were admitted to the medical and surgical services of Harper Hospital during the fall and winter of 1941 and 1942. These cases were grouped as follows: (a) jaundice, (b) hepatomegaly, (c) metastatic malignancy of the liver, (d) hepatic congestion in cardiac failure, and (e) miscellaneous.

A low level of prothrombin in plasma represents reduced production of this protein by the liver. In uncomplicated biliary obstruction or fistula, Vitamin K deficiency inhibits this liver function. Supplying an adequate amount of Vitamin K results in a rapid prothrombin rise. However, in cases in which there is liver damage, acute or chronic and with or without icterus, prothrombin production is severely limited by the number of remaining functioning cells, and its measure seems to furnish a reliable index of existing function. Gradual changes may be readily detected by this method. A mixed picture may, however, be present in biliary cirrhosis, in which case the maximal prothrombin response is limited by the amount of cirrhosis. Instances of acute hepatitis, biliary obstruction, portal cirrhosis, malignant destruction of liver tissue, and chronic congestion have been presented to demonstrate these points. Simplified prothrombin tests measure the concentration of prothrombin present plus any alteration in the rate of its convertibility to thrombin. In patients with moderate liver damage there frequently exists a compensatory mechanism whereby clotting times are made normal despite insufficient prothrombin. Only in far advanced liver disease does this compensatory mechanism begin to break down and place the patient in danger of hemorrhage.

The quantitative prothrombin test, though complex, is quite accurate. From the patient's standpoint it is very simple, only a venipuncture being required. It is not limited by certain features of the more commonly used liver function tests. The galactose-tolerance test is positive only during acute hepatic episodes; the hippuric-acid excretion, although of established reliability, is dependent upon normal renal function; jaundice reduces the use of the bromsulfalein test. The new tests, such as serum cholesterol, serum phosphatase, and the serum-colloidal gold reaction, are, like the test for prothrombin, awaiting further clinical experience.

The author concludes that quantitative plasma-prothrombin determinations appear to afford a valuable aid in the interpretation of liver function. When the prothrombin level is depressed and Vitamin K administration is ineffective in correcting the hypoprothrombinemia, impaired liver function may be reasonably assumed. The various onestage prothrombin tests have an important place in the determination of a bleeding tendency, but only when damage is extreme do they reflect the liver's status.

HERBERT F. THURSTON, M.D.

Sweet, N. J., Lucia, S. P., and Aggeler, P. M.: A Clinicopathological Correlation Between Hepatic Damage and the Plasma Prothrombin Concentration. *Am. J. M. Sc.*, 1942, 203: 665.

It has been suggested that the concentration of prothrombin in the plasma might be used under certain circumstances as a test of hepatic function. In most of the instances reported to date, the estimation of hepatic damage has been based solely on clinical evidence. Sweet *et al.* attempted to ascertain the histopathological appearance of the liver obtained at operation or autopsy, and correlate it with the known plasma prothrombin concentration. The recorded value of the prothrombin concentration was that obtained after the administration of an adequate dose of Vitamin K, and the study was done upon patients in whom a clinical diagnosis of the liver was made.

In general, the conclusions arrived at were:

1. The prothrombin concentration was normal when there was little or no destruction of parenchymal tissue and that it was diminished when

there was moderate or advanced destruction of the parenchymal tissue.

2. There seems to be a better correlation between the prothrombin concentration and the histological appearance of the liver than there is between the prothrombin concentration and the results of the hippuric-acid liver-function tests.

3. The prothrombin concentration is the less sensitive indicator of liver function but the more accurate detector of actual parenchymal hepatic-tissue destruction. STEPHEN A. ZIEMAN, M.D.

Paulson, M., and Wyler, C. I.: Multiple Tests of Hepatic Function in Gastroenteric Malignancy; The Value of Bromsulfalein, Hippuric Acid, and the Van den Bergh Reaction in Detecting Hepatic Metastasis, with an Evaluation of Normality of the Hippuric-Acid Test. *Ann. Int. M.*, 1942, 16: 872.

From time to time throughout the past years, communications have appeared which have indicated that the prediction of the existence of hepatic metastasis was a possibility. It was with this literature in mind that the authors decided to determine whether application of the hippuric-acid synthesis to this problem would be of benefit. Accordingly this test was performed, together with the bromsulfalein determination and the quantitative indirect Van den Bergh reaction on 25 patients with carcinoma of the stomach or colon who had no clinical evidence of metastasis. A correlation was found to exist between the presence of gross hepatic metastasis, as determined at subsequent operation and the degree of bromsulfalein retention, although individual exceptions occurred. No significant correlation was found between the presence of metastasis and the amount of hippuric acid excreted. However, in all 6 cases in which no hippuric acid was found, metastases were present. The Van den Bergh reaction was not of diagnostic aid.

Because of the uniformly low levels of hippuric-acid excretion found in these cases of carcinoma, a second series of 25 patients of comparable age and sex distribution was tested. This latter group was composed of individuals who had no signs, symptoms, or good historic reason for hepatic damage but who were suffering from a wide variety of acute and chronic diseases. Sixteen of these patients showed lowering of the hippuric-acid synthesis below the level considered as normal, although in 23 of the 25 cases the bromsulfalein excretion was entirely within normal limits. It is suggested that extreme delicacy in tests of hepatic function may detract from their importance as diagnostic aids because they too frequently may give abnormal results in cases in which liver damage is slight and is a relatively unimportant part of the general clinical picture. This in no way invalidates the serial use of the most delicate tests to follow the course of the liver disease and so determine the prognosis. Neither do the above statements apply to those tests used in the differentiation of intrahepatic from extrahepatic icterus.

This concept (that liver-function tests can fail if too sensitive) is somewhat different from that usually held—that the failure of tests of hepatic function is primarily due to their grossness.

JOSEPH K. NARAT, M.D.

Curl, H.: High Fat Diet Preceding Cholecystography. Studies on Filling of the Normal Gall Bladder. *J. Am. M. Ass.*, 1942, 119: 607.

The author has attempted to correlate observations reported in the literature pertaining to the influence of various factors on filling of the gall bladder with the results of cholecystography performed 512 times on 182 medical students. He concludes that fat is an essential factor in the gall-bladder emptying mechanism. If the gall bladder of patients on a fat-free or a low fat diet has not emptied for days it may be distended with thick, concentrated bile and, unable to admit more bile, will not be visualized on roentgen examination.

It is advised that for routine gall-bladder examination or when the history of cholecystitis is questionable, the patient be put on a high fat diet for several days or even weeks before the roentgen examination. WALTER H. NADLER, M.D.

Millbourn, E.: Clinical Studies of Choledocholithiasis (Klinische Studien ueber die Choledocholithiasis). *Acta chir. scand.*, 1941, 86: Supp. 65.

The material used as the basis for this study consists of 284 cases of stone in the common duct, with positive diagnoses of choledocholithiasis, coming under treatment in the surgical clinic at Lund during the fifteen years from 1925 to 1939. The diagnosis was verified at operation in 196 (67 per cent), by the passage of the stone per anum in 67 (33 per cent), and at autopsy in 27 (10 per cent). In the study of the icteric patients the presence of an icteric state was adjudged both by the discoloration of the skin and the sclerae, and by the results of the Van den Bergh test. Early in the biliary attack the blood-icterus values may be elevated without icteric discoloration of the skin, and late in the attack, as a rule, the discoloration outlasts the elevated blood-pigment values, as though the bile pigment disappears from the blood serum more rapidly than from the cells of the skin. Another source of discrepancy in the Van den Bergh test is described by Meulengracht, the excessive amounts of bile pigment precipitated together with the protein fraction from the blood serum, the amounts differing considerably without a discernible sign of the grade of icterus present. The Meulengracht method—a direct colorimetric reading of the intensity of bile pigment in the blood serum—which is certainly to be regarded as much more exact (Meulengracht. *Ugeskr. laeger*, 1921, 20: 1; 1927, 17: 352) was not used in this material, except in 1 instance in which it gave figures more nearly consonant with the degree of jaundice present than did the Van den Bergh test.

For determining the amount of diastase in the urine, Skoog's modification of the Wohlgemuth

method was employed. This method consists essentially in determining, by means of iodine-KI solution as the indicator, the point of complete digestion of starch solution by a series of graduated concentrations, in salt solution, of the patient's urine. The consistency of the tests and the length of time in which the tests for urinary diastase were conducted, the extent and thoroughness of the search for concrement in the stools, and the number of exactly observed and chronicled case histories in this material seem to be greater than those in the reports of previous writers on this subject.

Some of the newer methods of diagnosis in the field of choledocholithiasis are mentioned by the author in the course of this vast study, but were not employed to any extent in the material here presented, and consequently had little effect on the results. There were also many interesting side lights which developed during the course of the author's statistical manipulations, such as his substantiation of the ductogenic theory of the causation of pancreatic complications in biliary disease; his demonstration by means of cholangiography of the return of function to the sphincter of Oddi, three weeks after its dilatation to admit the passage of a concrement the size of a hazelnut; and his demonstration of the relationship between the size of the concrement and its ability to pass the papillary region and cause pancreatic symptoms, for details of which the original article must be consulted. The essential theme in this article appeared to deal with the value of the test for urinary diastase, in conjunction, incidentally, with such biliary manifestations as pains and jaundice, in the diagnosis and prognosis of choledocholithiasis, and the possibility of the "overlooked" stone in the common duct as an explanation of the postoperative symptoms.

In the attempt to evaluate the significance of elevated urinary diastase in detecting the presence of stone in the common duct, 263 of the 284 patients known to have choledochus stone, whose urinary diastase had been more or less thoroughly observed, were selected. Among these 263 was a group of 191 patients who exhibited icterus during their hospital stay, of whom 82 (43 per cent) also showed an elevation of their urinary diastase, and a group of 72 patients who did not exhibit icterus during this time, of whom 17 (24 per cent) also showed elevation of urinary diastase.

Another grouping showed that only 6 per cent of those who did not have pain during their hospital stay, including two days before their entrance, exhibited an elevation of the urinary diastase, while 40 per cent of those who did have such attacks of pain showed an elevation.

Other statistical manipulations with the same object in view were of less importance, but all tended to show that elevation of the urinary diastase as an isolated symptom indicating stone in the common duct is not as constant or dependable as has often been presumed in the past. However, the author's studies seem to show that when there is an elevation of diastase present, it is more uniformly related to the presence of stone in the common duct than has been assumed in the less extensive and less thorough studies of the past; for instance, the diastase tests have not been continued for so long a time or so consistently, and not so much attention has been paid by previous writers on this subject to the search for biliary concrements in the stools.

In reference to the relationship existing between elevation of the values for urinary diastase and the presence of pancreatic complications in biliary disease, not much is added to what previous authors have found. One hundred and four (40 per cent) of the 263 patients whose urinary diastase was subjected to study proved to have a pancreatic complication, that is, in 25 of the 104 patients the diagnosis was unequivocal, in 15 it was probable, while in the remaining 64 the acute pancreatic affection was probably induced by a mild, transient reflux or stasis in the pancreatic duct, arising from direct obstruction by the stone to the outflow of bile and pancreatic secretions into the duodenum by incarceration of the concrement in the opening, or from a reflex spasm in the sphincter of Oddi. The resulting stasis in the pancreatic duct, however, did not occur during an active phase of the pancreatic secretion (post cibum), or was not sufficiently prolonged to result in detectable gross anatomical damage to that organ.

Consequently, of these 263 patients in whom a more or less thorough and often long-continued investigation of the urinary diastase was carried out, 104 were diagnosed as having acute pancreatic affection, and of these 99 exhibited an elevation of the diastase values. These figures, of course, include all cases, severe and light, in which such a diagnosis was made, and the 5 patients in whom such an elevation of values was not determined were included in the 25 patients of this group with proved gross anatomical changes in the pancreas. The author therefore suggested that in these 5 negative examples of gross anatomical changes of acute pancreatic affection, the elevation of diastase may have been present earlier in the attack, but because of the brief transitory character of the elevation, the values may have already receded before the test could detect them, or, in 1 case with kidney involvement, an abnormal concentration of the ferment was not able to develop.

The author's studies also bear out the view of Skoog, that the degree of elevation of the urinary diastase does not parallel the severity of the pancreatic involvement. In the author's material, the more severe forms of pancreatic affection with gross anatomical changes exhibited oftener a moderate than a high degree of elevation of the urinary diastase. As an example, in 12 of the 20 cases of pancreatic affection with gross anatomical changes in which the severe character of the involvement was proved at operation or autopsy, the elevation of the values for urinary diastase was of moderate degree, and the values in the remaining 8 proved to be high or very high at one time or another during the attack. On the other hand, in the apparently milder

forms of pancreatic affection with gross anatomical changes, the diastase values more frequently exhibited a high degree than a moderate degree of elevation. As an illustration, in 15 patients the clinical symptoms (pain, resistance and tenderness to pressure on the left side and collapse during a biliary attack) suggested that an acute pancreatic complication had arisen, yet at operation or autopsy no changes of a gross anatomical nature in the pancreas or surrounding tissues could be demonstrated. This may have been due to the length of time which elapsed since the regression of the attack, but the findings as a whole suggested that these cases must have been of a milder character than the group of 20 noted before. In this group of 15 presumably milder cases only 4 exhibited a consistently moderate degree of elevation of the urinary-diastase values, while the remaining 11 showed markedly elevated values at some time or other.

The remaining 64 cases of the 108 with some degree of pancreatic involvement apparently did not show gross anatomical changes. In this group the degree of elevation of the urinary diastase was more frequently moderate (38 cases) than marked (26 cases), but this apparent lack of consistency in the urinary-diastase test as a prognostic medium is explained by the author on the basis that many of these attacks result from a reflux pressure back against the pancreas that is so light and transient in character that the resultant injury to that organ is too insignificant to give rise to a marked diastase response.

Even in those cases of biliary attack in which no elevation of values is detected, the possibility of acute pancreatic complication is not excluded as the elevated values tend to return to normal rather quickly—less quickly when the pancreatic involvement has caused gross anatomical changes. On the other hand, exclusion of the presence of an acute pancreatic complication in the absence of elevation of the urinary diastase following the onset of symptoms of an acute biliary attack indicates with fair certainty that if the diastase test remains negative from one and one-half to two days following the onset of symptoms pancreatic complications will not arise.

Finally, the postoperative findings in the patients in this material who underwent operation were subjected to examination with the principal purpose of determining to what extent these manifestations were due to the overlooking at operation of a stone in the common duct. These findings consisted essentially in elevation in the urinary-diastase values, in the passage of biliary concrement per anum, and in subsequent biliary attacks, such as colic, jaundice, attacks of indigestion, and findings at subsequent reoperations, which were in answer to a follow-up questionnaire.

Postoperative studies of urinary diastase were conducted on 124 patients who had been choledochotomized, and elevated values were found in 28 (23 per cent). In 19 (15 per cent) the rise occurred immediately following operation. The marked discrepancy between the patients who had an elevated diastase before operation (28 per cent) and those who had not (6 per cent) suggested that in some instances at least the elevation may have carried over from the preoperative elevation, and in others might be due to operative trauma to the pancreas (manipulation of organ, sounding in the common duct). In the latter cases the elevation occurred at once or the day following the operation, did not last more than one or two days, and was moderate in degree.

In 111 of these patients the diastase studies could be carried out further into the postoperative period, and in this group 13 (12 per cent) exhibited an elevation of diastase values at some time or other in the further postoperative course. Here again it was found that the percentage of patients (17 per cent) exhibiting elevation of urinary-diastase values late in the postoperative course was greater in those who had shown preoperative elevation of the diastase, than in those who had not exhibited such elevation preoperatively (6 per cent). This discrepancy in the late postoperative period suggested that the cause was the overlooking of a stone or stones in the common duct at the time of operation. In fact, in 2 of these 13 cases it was later proved that the postoperative elevation was due to the overlooking of a stone in the common duct; in 4 others this explanation was regarded as extremely likely; and in the remaining 7 cases the author regarded it as quite possible.

In 51 patients following operation a search of the stools for choledochus stone was continued. In 32 the search continued until the patients were discharged from the hospital, and a concrement or concrements passed in 20. In 11 of these 20 patients who passed stone postoperatively the common duct had been opened and examined (in all of them the gall bladder had been removed at operation) with extraction of a common-duct stone in 8 and negative findings for choledochus stone in 3, yet in 4 of these 11 cases stone was later passed without pain or other manifestation of disturbance of the course of postoperative healing. The possibility remained, of course, that the operator may have pushed the concrements through into the intestine at the time of operation. In 7 patients the passage of stone was suggestively accompanied and preceded by attacks of colicky pain.

The author's material shows that in 15 per cent of the patients who had biliary symptoms following choledocholithotomy it was practically certain that the trouble was due to concretion overlooked at operation, while in 14 per cent it was probably due to that cause. In no case was there evidence that the stones passed were such as could have reformed postoperatively in the common duct or elsewhere—in nearly all of the author's cases the gall bladder was completely removed at operation—and in no case was there evidence to suggest that the postoperative symptoms were due to stricture of the bile ducts. Since the incidence of postoperative symptoms in

the author's material agrees on the whole, as far as the author can find, with the figures in the literature, the inference is that the explanations of previous writers on this subject are at least frequently not correct, and that the true cause of these symptoms will be found in the failure to do a sufficiently radical choledocholithotomy. The author consequently recommends cholangiography during operation and even a control cholangiography before the end of the operation to avoid the leaving of any concretion in the ducts, and he emphasizes the utmost care in diagnosis and operative technique in order that all stones in the biliary tracts be removed at operation.

JOHN W. BRENNAN, M.D.

Puestow, C. B.: Spontaneous Internal Biliary Fistulas. *Ann. Surg.*, 1942, 115: 1043.

Fistulas between the gall bladder or bile ducts and nearly all portions of the gastrointestinal tract, as well as the bladder, uterus, kidney pelvis, portal vein, ovarian cysts, pericardium, and bronchial tree have been reported. Probably most gall stones sufficiently large to produce obstruction have reached the lumen of the bowel through a fistula.

Roentgenographic diagnosis of internal biliary fistula is based chiefly upon the presence of air in the biliary passages or upon the influx of barium during a gastrointestinal study. However, only a small percentage of cases are diagnosed prior to operation.

Most internal biliary fistulas are formed by the erosion of a gall stone through the gall bladder or common-duct wall into an adjacent viscus. Ductal obstruction below the level of the stone and severe inflammation probably accompany the process. Duodenal ulcers or malignant lesions may occasionally erode the gall-bladder wall, and produce a fistula.

In a series of 500 operations for benign biliary-tract diseases, the author encountered spontaneous internal biliary fistulas in 16 patients, 9 of which fistulas were cholecystoduodenal. A history of pain, chills, fever, and jaundice generally was present. These patients did not obtain apparent relief of symptoms with the spontaneous establishment of a fistula, but became progressively worse.

At operation, stones were found obstructing the common duct in a majority of cases. Cystic-duct obstructions were present in 2. It was usually possible to close the fistula, and proceed with cholecystectomy and choledochostomy. The virulence of infection in the gall bladder and bile ducts was much more marked with cholecystocolic than with cholecystoduodenal fistulas. Fistulas between two portions of the extrahepatic biliary tract are rare; 1 such case occurred in this series. Fistulas originating at the liver or bile ducts and extending through the right diaphragm to communicate with a bronchus usually are due to gall stones, amebic abscesses, or hydatid cysts of the liver. There is usually a history of biliary disease with an elevated right diaphragm and later pleural effusion. Bile is present in the sputum.

The mortality of surgery for internal biliary fistulas has been reported at 10 per cent or higher. In this series of 16 patients there were 3 deaths, a mortality of 19 per cent, compared to a mortality of 1.2 per cent for uncomplicated cholecystectomies. This is undoubtedly due to the debility, liver damage, and prolonged sepsis associated with these lesions. The average length of hospital stay after operation was twenty-three and five-tenths days compared to twelve and seven-tenths days for all other operations for benign biliary-tract disease.

It is evident that the regurgitation of intestinal contents into the bile ducts is very damaging to them and the liver, as cholangitis and hepatitis occur almost invariably. The distal end of the choledochus normally has three important structures to prevent duodenal regurgitation: the sphincter of Oddi, the duodenal musculature, and the valvelike folds lining the ampulla of Vater.

It must be determined whether the jaundice associated with internal biliary fistulas is due to obstruction or hepatitis, as the presence of the latter should make one cautious in instituting surgical therapy. The degree of drainage of bile by the fistula as indicated by the amount of bile in the intestine is an important guide. Careful judgment as to the time of operation, and intensive preoperative and postoperative care are essential. When severe cholangitis exists, stones may reform repeatedly in the bile ducts.

In the discussion, TROUT reported a case of intestinal obstruction due to a gall stone, in which the common duct was dilated with air on x-ray examination. FINNEY reported 2 cases of multiple biliary fistulas. WOLFER emphasized the great weight loss exhibited by patients with this condition. BISGARD commented on errors which could be made by wrong interpretations of roentgenograms in these patients.

S. LLOYD TEITELMAN, M.D.

Sweet, R. H., and Warren, S.: Hamartoma of the Spleen. *N. England M. J.*, 1942, 226: 757.

Hamartoma is a tumor composed of tissue, present in excess of normal requirements, that can hardly be distinguished from the normal, but possesses a limited capacity for aberrant growth. In the spleen it

Fig. 1. Cross section of the spleen, showing resemblance of the tumor to splenic pulp.

is sometimes termed splenoma and is probably of embryonic-rest origin. The only symptom is splenic enlargement.

Sweet and Warren report a case of hamartoma of the spleen occurring in a fifty-nine-year-old woman. A palpable splenic tumor, visible also upon x-ray examination, led to a preoperative diagnosis of cyst of the spleen. A tumor the size of a large grapefruit was found in the substance of the spleen. The spleen was removed and upon examination a well demarcated but not clearly encapsulated tumor was seen.

EARL GARSIDE, M.D.

MISCELLANEOUS

Sutton, H. B.: The Intraperitoneal Use of Sulfathiazole, with Special Reference to the Production of Adhesions. Report of a Case with Secondary Intestinal Obstruction. *J. Am. M. Ass.*, 1942, 119: 559.

Sulfanilamide and sulfathiazole are frequently used intraperitoneally, particularly in those infections secondary to acute appendicitis. Although sulfanilamide is said not to produce peritoneal adhesions, there is evidence that sulfathiazole often causes peritoneal irritation and occasionally inhibits wound healing.

The author reports a case of acute perforative gangrenous appendicitis with peritonitis in a boy of ten years. In this case, the intraperitoneal use of sulfathiazole crystals was followed by long delayed wound healing and a keloid scar. Three months after operation, the patient developed an intestinal obstruction due to adhesions in the areas where sulfathiazole had been placed. Secondary operation to relieve the obstruction was necessary. Apparently, sulfathiazole stimulated an excessive production of fibrous tissue, both in the wound and on the peritoneum.

S. LLOYD TEITELMAN, M.D.

Kaufman, L. R., Serpico, S., and Mersheimer, W.: Rare Complication of the Miller-Abbott Tube. *Am. J. Surg.*, 1942, 57: 173.

Review of the literature reveals reports of 9 cases of severe laryngeal injury requiring tracheotomy which was produced by inlying suction tubes. To these the authors add 1 case of acute edema of the larynx requiring tracheotomy which was produced by intubation with a Miller-Abbott tube.

The authors believe that careful daily inspection of the larynx should be performed in all patients requiring prolonged intubation with inlying suction tubes.

Edema may result not only from the trauma of the tube but also by reason of regurgitation of the acid stomach contents. In the authors' case the degree of edema required immediate tracheotomy for control of asphyxia.

JACOB M. MORA, M.D.

GYNECOLOGY

UTERUS

Birnberg, C. H., Kurzrok, L., and Weber, H.: The Effect of Pregneninolone (Ethinyl Testosterone) upon Human Cervical Secretion. *Am. J. Surg.*, 1942, 57: 180.

It has long been known that the cervical mucus is normally alkaline, and that the penetration of sperm through the cervical secretion is apparently much better when this condition prevails than when the hydrogen-ion concentration tends to be more acid. Up until this time efforts to change the acidity of cervical mucus from a hydrogen-ion concentration of from 5 to 6 to that of an alkaline hydrogen-ion concentration of 8 have not met with much success. An acid cervical mucus is a deterrent to semen penetration and thus can cause sterility. The authors describe the technique of the semen penetration test. The test is negative when the spermatozoa are repelled by the mucus so that they cannot penetrate it. The hydrogen-ion concentration of the cervical mucus was determined at the same time that the semen penetration test was made. In 5 of the 6 cases presented herewith, the hydrogen-ion concentration was 6 or less during various phases of a menstrual cycle. There was no local condition such as endocervicitis to account for this abnormality. Attempts to alter this condition by local treatment, the injection of estrone or progesterone, failed. These patients were then given 10 mgm. of pregneninolone (pranone) twice daily through the cycle and the effects were observed.

The acidity of the cervical mucus was changed to a hydrogen-ion concentration of 7 or 8 and the semen penetration tests became effective in 5 cases. Three of the patients subsequently became pregnant. There was no change in 1 case.

HERBERT F. THURSTON, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Israel, S. L.: The Clinical Similarity of Corpus-Luteum Cyst and Ectopic Pregnancy. *Am. J. Obst.*, 1942, 44: 22.

The history, pathogenesis, and histology of the corpus-luteum cyst are briefly reviewed. It is emphasized that, aside from being recognized as a perversion of physiology often attributable to temporary hyperpituitarism, little is known concerning its cause.

The clinical similarity of the corpus-luteum cyst and certain types of ectopic pregnancy, an observation credited to Halban, is discussed. It is shown that both conditions may present identical symptoms and pelvic signs, as well as similar laboratory findings.

Five patients, each of whom had a corpus-luteum cyst which was diagnosed preoperatively as ectopic pregnancy, are cited. The condensed histories and the accompanying illustrations sufficiently exemplify the ample reasons for the diagnostic errors, including the presence of a falsely positive biological pregnancy test in 2 instances.

The probable physiological mechanisms of the excessive excretion of gonadotropin (positive Friedman test) and of the decidualike pattern of the endometrium, both of which are shown to be possible in association with a corpus-luteum cyst, are described.

It is suggested that even if patients with a suspected adnexal tumor and a history suggestive of ectopic gestation were not operated upon immediately, but were first carefully observed in a hospital for several days it would be difficult to escape the possibility of an occasional needless abdominal operation.

EDWARD L. CORNELL, M.D.

Blackmun, R. L.: Ovarian Tumor with Masculinizing Syndrome. *Am. J. Obst.*, 1942, 43: 1036.

The case presented by the author may be regarded as an instance of the condition under discussion, for clinical masculinity developed in a patient who previously had been completely feminine. Furthermore, the removal of the left ovary was followed by a reversal of symptoms with re-establishment of the female habitus. The yellowish-brown tumor of the left ovary was composed histologically of large, clear, fat-containing cells with large nuclei arranged in irregular strands. The resemblance of these cells to corpus-luteum cells was most conspicuous, and it seems logical that this tumor and the clinical picture can best be explained as a result of tumor develop-

Fig. 1.

Fig. 2.

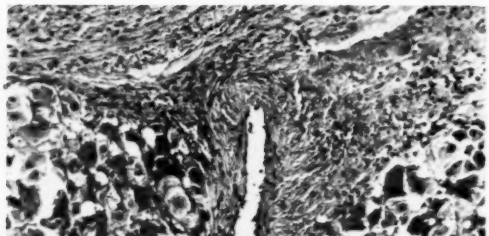

Fig. 3.

ment with a perversion of secretion of the lutein cells. EDWARD L. CORNELL, M.D.

MISCELLANEOUS

Palmer, A.: Cyclical Estrogen Therapy. *Am. J. Obst.*, 1942, 44: 56.

The harmful effects of continuous as opposed to cyclical estrogen treatment in experimental animals and human beings have been reviewed and discussed. The release of diethylstilbestrol for general use makes it necessary to observe certain principles of treatment that were relatively unimportant before the advent of inexpensive and highly potent estrogens.

The recommended therapeutic dose of diethylstilbestrol for cyclical therapy in menopausal women varies between 0.1 and 0.5 mgm. daily by mouth for twenty-one days, followed by an interval of from five to ten days without therapy. The estrogen withdrawal interval should fall at the time of expected menstruation, and the cycles of therapy should be started from twenty-four to forty-eight hours after the onset of a new phase of uterine bleeding if it occurs.

The recommended therapeutic dose of diethylstilbestrol for cyclical therapy in young women with hypo-ovarian amenorrhea or primary hypogonadism is 1 mgm. daily for seven days followed by 5 mgm. daily for seven days (total dose 42 mgm. in fourteen days). The estrogen withdrawal interval should be fourteen days, so that subsequent cycles of therapy may be started at twenty-eight-day intervals.

Cyclical, as opposed to continuous, estrogen therapy is strongly recommended in all hypo-ovarian conditions, even though the absence of the uterus precludes the occurrence of bleeding as a troublesome factor.

At least daily, as opposed to less frequent, administration of diethylstilbestrol or other unesterified estrogens during a cycle of therapy is recommended for the purpose of maintaining an excretory and probably a circulating estrogen level.

EDWARD L. CORNELL, M.D.

Saphir, W., and Weinglass, A. R.: Severe Angioneurotic Edema Following Diethylstilbestrol Therapy. *J. Am. M. Ass.*, 1942, 119: 557.

Ever since its recent release by the Food and Drug Administration, diethylstilbestrol has enjoyed wide popularity among physicians as well as the public. Its real value has been attested by numerous clinical and experimental studies. However, in view of the fact that toxic manifestations have already been reported, a word of caution seems in order.

Toxic reactions reported were nausea, vomiting, abdominal distention and cramps after meals, anorexia, diarrhea, vertigo, and paresthesias. Other toxic manifestations observed were cutaneous rashes, such as diffuse brawny erythema and pruritic papular and macular eruptions. The authors present in detail herewith a hitherto unreported toxic reaction to diethylstilbestrol, namely, a severe and alarming form of angioneurotic edema.

Available evidence indicates that diethylstilbestrol, an effective synthetic estrogen, is being widely used, perhaps partly because of the publicity given this drug in the lay press. The case reported in this article was one of severe angioneurotic edema of the face and neck which appeared after a six-day course of 0.5 mgm. of diethylstilbestrol daily. Danger of edema of the glottis necessitated hospitalization.

The etiological relationship between diethylstilbestrol medication and the angioneurotic edema is believed to be confirmed because of a strongly positive cutaneous reaction to diethylstilbestrol, because of the absence of other possible allergenic factors in a hitherto nonallergic person, and, finally, because of the complete disappearance of symptoms following cessation of the diethylstilbestrol treatment.

HERBERT F. THURSTON, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Viets, H. R., Schwab, R. S., and Brazier, M. A. B.: The Effect of Pregnancy on the Course of Myasthenia Gravis. *J. Am. M. Ass.*, 1942, 119: 236.

The effect of pregnancy on myasthenia gravis is usually favorable. The authors present a series of 8 patients, in 2 of whom delivery had been supervised. Most patients experience a definite remission in symptoms, and relapses, if they occur, are mild. Patients on a maintenance dose of prostigimine before pregnancy may experience a complete remission during the second and third trimesters, and the remission may last from three to six months after delivery. Relapses usually occur in the first trimester, when the patient may be at her lowest point.

In general, either with or without prostigimine, labor itself is not usually affected by the presence of myasthenia gravis. A patient with severe involvement in a state of relapse may have a prolonged and somewhat difficult labor, but this is not the usual experience if the prostigimine intake is well adjusted. The fear of complications during labor should not justify abortion at an early stage of pregnancy.

A second pregnancy does not carry more hazard than the first in patients with myasthenia gravis. Pregnancy, labor, or nursing does not affect the course of the disease unfavorably under the present conditions of treatment. CHARLES BARON, M.D.

Johnston, R. A., and Adam, G. F.: Pregnancy Complicated by Hookworm Disease. *Texas J. M.*, 1942, 38: 35.

Whenever a severe anemia is encountered in the absence of any tangible cause, one should always think of an intestinal parasitic infestation, especially hookworm. Hookworm disease is seen most frequently in charity clinics, especially among those patients coming in contact with the soil. Most of the cases in this country are seen in the southern states, and usually are not severe infections.

Six cases of hookworm disease have been encountered by the author; 3 of these were seen in private practice among 6,350 cases, and 3 in the charity clinic of Hermann Hospital, Houston.

The chief characteristic of this disease is anemia, the hemoglobin being as low as 15 per cent in some cases. The anemia is usually of the hypochromic microcytic type, but it may simulate pernicious anemia. The second important characteristic of this disease as complicating pregnancy is the presence of toxemia of pregnancy, the severity of which depends on the severity of the infection and on the degree of anemia.

The details of the 6 cases are reported. In all instances the most striking features were anemia and toxemia. As a possible explanation of the cause of the toxemia in these cases, the authors refer to the work of Herman W. Johnson, Robert A. Johnston, and H. O. Nicholas on the poisonous amines as etiological factors in eclampsia and pre-eclampsia. Infections of this kind produce an increased permeability of the bowel wall, which allows the colon enzymes, or the bacteria themselves, and enzymes of various strains of streptococci to enter the blood stream. The bacteria or their enzymes transform the amino acids to their respective amines, which may give rise to the symptomatology and the pathological condition of eclampsia. The anemia may be due to a disturbed absorptive power of the gastrointestinal tract.

The anemia and the hookworm infection should be treated first as many of these patients can be carried further along in pregnancy if the infection is eradicated. The patient should first be given repeated small blood transfusions. Then the hookworm infection should be treated. The most common drugs used are oil of chenopodium, carbon tetrachloride, tetracholorethylene, and hexylresorcinol. As carbon tetrachloride has a similar toxic effect on the liver as the toxin of eclampsia or pre-eclampsia, the authors do not recommend the use of this drug during pregnancy.

Repeated stools should be examined for egg counts and treatments should be repeated until no ova are found. Reduced iron should be given in massive doses. When the hookworm disease and the anemia have been properly treated, the management of the pregnancy should be carried on in a normal way. DANIEL G. MORTON, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Studdiford, W. E.: Observations on Hemolytic Streptococcus Infections Following Delivery and Abortion Since the Advent of Sulfanilamide. *Am. J. Obst. & Gynec.*, 1942, 43: 619.

The author reports 13 cases of severe localized or spreading hemolytic streptococcus infection, all of which were observed on the gynecological service of Bellevue Hospital, New York, since 1938. While the group of cases is small, the author believes they are worth describing because this type of infection has been seen but rarely in New York during the past five years.

In 11 cases the infection occurred in patients suffering from abortion, some instances admittedly, and all presumably, induced. In the remaining 2 cases, the infections occurred in post-partum patients who delivered normally at home. In 1 of these the mother developed an extragenital hemolytic streptococcus infection before delivery. Bacteriological diagnosis was the main basis for treatment in this group, and the diagnosis in all cases was made within twenty-four hours of admission to the gynecological service.

Sulfanilamide was used throughout this series. At first, relatively small doses were administered 3 times a day, mainly because of fear of toxic effects. During the past year, 12 gm. of sulfanilamide a day have been given to patients with septicemia and after a period of from forty-eight to seventy-two hours the dosage has been gradually diminished. Serious toxic effects have not been noted, although they are to be expected in the future.

Many of these patients had unpleasant reactions, such as cyanosis, mental confusion, and nausea, which proved merely transitory phenomena limited to the period of treatment. A pronounced leucopenia was observed in only 1 patient.

It was found that surgical evacuation of the uterus could be performed with relative safety after adequate sulfanilamide therapy had been in force for forty-eight hours. It is believed that this procedure, when indicated by the retention of placental fragments, is of importance in the early elimination of organisms from the uterus.

In this group of 13 patients, there were 2 deaths, a mortality of 15.4 per cent. However, if one merely considers the 8 patients with septicemia or general peritonitis, or both, the mortality was 25 per cent. The latter group of cases is comparable with the 12 cases seen prior to June, 1936, when chemotherapy was not available, and the reported mortality was 83⅓ per cent. This is a tremendous improvement which, it is hoped, may be made still better in the future. EDWARD L. CORNELL, M.D.

NEWBORN

Javert, C. T.: Further Studies on Erythroblastosis Neonatorum of Obstetrical Significance. *Am. J. Obst.*, 1942, 43: 921.

A classification of erythroblastosis based on 55 cases is presented. The incidence of the disease is 1:438. The mortality rate appears to decrease in infants born nearer term.

Primiparas having infants with erythroblastosis seem prone to have subsequent babies with the disease, while the recurrence in multiparas is about 50 per cent. Such a relationship points to a dominant mendelian characteristic inherited from the parents, and the Rh factor was discussed from this point of view.

Intraplacental hematomas were found in 8 cases. These were of varying age, and contained numerous normoblasts and erythroblasts, most likely of fetal origin. Such lesions provide for the transmission of the Rh agglutinogen, or some other factor as yet unknown, from the fetal circulation to that of the mother. In such a manner, isoimmunization of the mother could take place.

The formation of antibodies in the mother, with the passage of these through the placenta into the fetal circulation is probably responsible for the red-cell hemolysis and the widespread deposition of hemosiderin pigment which characterizes the disease. The chief maternal complications were toxemia of pregnancy and excessive uterine enlargement. Congenital anomalies in the infants were frequently observed. The relationship of erythroblastosis to missed abortion was seen in several patients. Early recognition of the disease, aided by studies of the cord blood, affords an excellent opportunity for prompt treatment. Histological studies of the placenta were confirmatory. Damage to the internal organs, particularly the liver, was borne out by pathological and physiochemical studies.

EDWARD L. CORNELL, M.D.

Halpert, B.: Intratesticular Hemorrhage—A Birth Trauma. *Am. J. Obst.*, 1942, 43: 1028.

The occurrence of intratesticular hemorrhage during birth in breech presentation is well recognized. It is not generally known, however, that such hemorrhage occurs as a birth trauma when the head is the presenting part. Furthermore, it is not realized that such hemorrhage occurs rather frequently and that it may be quite extensive. An incidental observation of such an instance led the author routinely to make gross and microscopic examination of the testicles of newborn infants at autopsy. In slightly over a year, among 21 male infants who died when less than one week old, 7 cases were encountered. An additional case was observed by Newbill. EDWARD L. CORNELL, M.D.

MISCELLANEOUS

Rutherford, R. N., and Mezer, J.: Regeneration of Uterine Mucosa after Spontaneous Abortion and Normal Delivery. The Therapeutic Indications. *J. Am. M. Ass.*, 1942, 119: 124.

The authors first studied regeneration of the uterine mucosa following normal full-term pregnancy. This was done by taking biopsy specimens of various patients, each patient furnishing a specimen at a different period post partum. They found that by the twelfth day the glands were regenerated completely; the surface epithelium completely covered the large majority of the stroma; and the myometrium had regressed almost entirely. Patients who were lactating did not present a different rate of regeneration than the nonlactating patients.

In the case of spontaneous abortion, ideally, ovulation occurs within the first two or three weeks after abortion. There was no endometrial evidence submitted that this is not as good a time for impregnation as any other. Curettage may be valuable in cases in which all products are identified as passed. Regeneration and ovulation may be prompt, but if curettage is delayed these processes may not take place for at least nine weeks.

Routine curettage is recommended in all cases of spontaneous abortion. Heavy doses of progesterone in the treatment of threatened abortion may possibly delay endometrial regeneration. Patients may be urged to seek impregnation within two weeks of spontaneous abortion. Following normal full-term pregnancy, the patient is susceptible to impregna-

tion after six weeks, although lactation may inhibit ovulation for a longer period of time.

T. Floyd Bell, M.D.

Ritchie, B. V.: The Calcium and Phosphorus Content of Milk from Australian Women. *Med. J. Australia*, 1942, 1: 331.

Because the figures for calcium and phosphorus content of maternal milk from Australian women were needed for another research study, and since these figures had never been determined, it was found necessary to undertake this investigational study.

Four hundred and sixty-seven determinations were made on milk from 165 women. These women were representative of the average Australian population, were not of the underprivileged class, and were in regular attendance at their child welfare station. A sample of milk was collected by the mother and brought with her when the infant was brought in for its regular monthly visit. Samples were collected more frequently, especially when the milk was found to be poor in calcium. These specimens were collected from the middle of the 6 a.m. and 2 p.m. feedings on the day the sample was collected.

The calcium and phosphorus content of the breast milk of these 165 women ranged from 17 to 42 mgm. per cent and from 7 to 21 mgm. per cent, respectively. This agrees closely with that of European and American women. The calcium content was found to reach its peak between the second and fourth months and then declined until the tenth month. The phosphorus values fall steadily from a peak at the first month until the eighth month. The calcium to phosphorus ratio was constant during the lactation period. The calcium and phosphorus contents of the milk did not appear to vary with respect to the number of previous children. The calcium and phosphorus contents of the milk of mothers with rhachitic infants were not different from those of mothers with normal infants. Extra calcium was administered to 5 women and was found to be increased in only 2 in which Vitamin D was administered concurrently with the calcium.

J. E. Fields, M.D.

Arendt, J.: Chorionepithelioma in the Male and Female Observed Roentgenologically. *Am. J. Roentg.*, 1942, 47: 591.

The aim of this article is to present a roentgenological description of the various forms in which chorionepithelioma might occur in the roentgenogram, the co-ordination between roentgenological and clinical diagnosis, an observation of 2 cases of extragenital chorionepithelioma in the male, and a discussion of the various problems and aspects which chorionepithelioma in the male presents.

Observations recorded by others are cited and attention is called to the fact that relatively few roentgenological references relating to the condition are available. In the 2 cases studied by the author, roentgenograms of the lungs presented rounded nodules of concentric growth with softness and blurring of the edge, which he thinks may be of importance in the differential diagnosis. With lung findings such as these the possibility of chorionepithelioma deserves consideration especially if it is combined with a mediastinal tumor or a large testicle in a male and a pathological pregnancy or abortion in a female. Once suspected, the Aschheim-Zondek reaction confirms or disproves the diagnosis.

Both of the author's cases were diagnosed during life by the roentgen appearance of the lung metastasis and verified in the first case by autopsy, and in the second case by the Aschheim-Zondek reaction, gynecomastia, and clinical course.

A. Hartung, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Forsythe, W. E.: Bilateral Hypernephroma. Report of a Case. *J. Urol.*, Balt., 1942, 47: 784.

A sixty-two-year-old male was hospitalized with complete urinary retention following hematuria of three days' duration, accompanied by increasing urinary distress. There was a history of painless hematuria of several days' duration three years previously.

Rectal examination showed the prostate to be enlarged to about twice the usual size, and adenomatous in consistency.

Excretory urograms were taken; these showed faint excretion of dye in the left kidney and no excretion in the right. Because of poor preparation, neither renal shadow could be defined. A cystourethrogram showed moderate prostatic hypertrophy. Observation cystoscopy, which was poorly tolerated, failed to reveal the source of the bleeding.

Because of continued bleeding and elevation of the blood-urea nitrogen from 25 to 29 mgm., a suprapubic cystostomy was performed under local anesthesia. There was moderate intravesical prostatic enlargement and no bladder tumor. The source of the bleeding was not located. The patient's condition improved after suprapubic drainage although the bleeding continued.

One week later, excretory urograms were again taken. These gave better visualization of the left kidney but still no evidence of function on the right side. These studies showed definite enlargement of the right renal shadow. At this time the right kidney was easily palpable and was much enlarged. A diagnosis of probable right renal tumor was made. Cystoscopy was repeated under caudal anesthesia, and gross blood was seen exuding from the right ureteral orifice. Right retrograde pyelography with a Woodruff bulb revealed a renal neoplasm with probable extension to the pelvis and upper ureter.

A right nephrectomy was performed, after supportive therapy including transfusions, and a kidney with extensive tumor involvement was removed. There was extension, which was inoperable, into the pedicle. The patient expired of cardiac failure forty-eight hours after operation.

Autopsy revealed tumor in the remaining portion of the pedicle and a tumor thrombus in the vena cava. In the midportion of the left kidney was a tumor measuring about 4 by 6 cm. Grossly this appeared to be a separate primary lesion. A careful search, including roentgen examination of the long bones, failed to disclose any metastatic lesions.

Microscopic examination of the tumor in each kidney showed a similar picture. Each tumor was composed of large clear vacuolated cells with small nuclei. The cells were growing in cords and masses. They were well differentiated, and mitotic figures were rare.

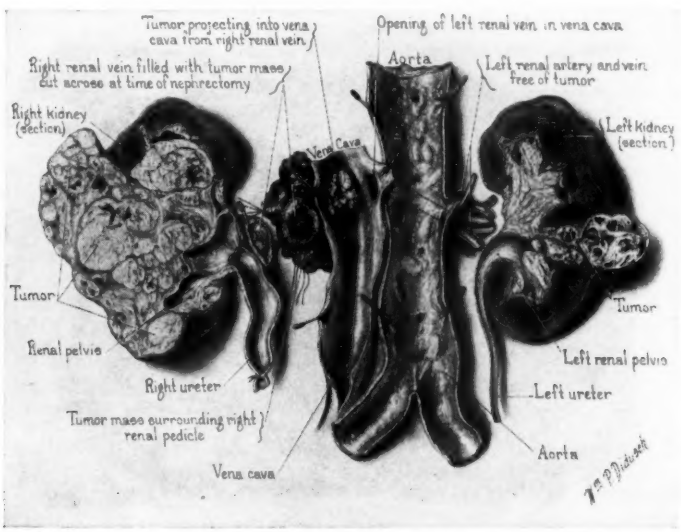

Fig. 1. Bilateral hypernephroma. Showing a large tumor thrombus in the right renal vein with extension into the vena cava. The left renal vein is free of tumor.

The pathologist believed that each tumor represented a primary lesion although it was realized that a hypernephroma may give rise to a solitary metastasis. JOHN A. LOEF, M.D.

Langworthy, H. T., and Drexler, L. S.: Carcinoma in Crossed Renal Ectopia. *J. Urol.*, Balt., 1942, 47: 776.

Renal ectopia is itself an unusual condition, although Thompson and Pace state that its incidence at the Mayo Clinic is about 1 in every 1,200 autopsies. In their series of 97 cases, 30 per cent were found to have some pathological changes, but carcinoma was not noted in this group.

Crossed ectopy is a far rarer clinical entity. The kidneys may be fused or unfused. One hundred and fifty-nine cases are reported in detail by Townsend and Frumkin. No evidence of neoplasm was noted in this series.

Twenty cases of the fused type of crossed renal ectopy are discussed by Mayer and in these, again, no case of carcinoma was found.

JOHN A. LOEF, M.D.

Slaughter, D., Van Duzen, R. E., Johnson, T. U., and Tobolowsky, N.: The Pharmacological Action of Drugs on the Isolated Ureter. *South. M. J.*, 1942, 35: 541.

"Transentin A," now designated as "Transentin 6-H," was the most efficient and constant ureteral spasmolytic drug used in the study reported by the authors. It had an antispasmodic effect on the isolated ureter, whether segments were spontaneously contracting or were stimulated by adrenergic, cholinergic, or myonergic drugs.

Atropine was fairly reliable in stopping the spontaneous contractions of ureteral segments and those stimulated by cholinergic drugs.

Depropanex was inconstant in its effects on the ureter; on occasion, it actually caused stimulation.

Octin usually stimulated the ureter. When octin brought about cessation of contractions, it was believed to be due to ergototoxinlike effects.

Emmenin, an estrogenic placental hormone, best approached the efficiency of "Transentin A." It was most efficient following atropine.

SAMUEL KAHN, M.D.

BLADDER, URETHRA, AND PENIS

Herger, C. C., and Sauer, H. R.: Large Bone Metastases from Carcinoma of the Bladder. *Am. J. Surg.*, 1942, 57: 29.

Metastatic involvement of the skeleton is common in all cases in which widespread metastases from carcinoma of the bladder are encountered. However, cases with large bony metastases which dominate the clinical picture are comparatively rare.

Four cases of large osteolytic bone metastases due to carcinoma of the bladder are presented. In 1 of these 4 cases the primary tumor responded so favorably to treatment that no cystoscopic evidence of the tumor was present at the time when the secondary lesion became apparent. Neither the extent nor the degree of malignancy of a bladder tumor represents a reliable indication as to the likelihood of the development of extensive metastatic lesions including bone involvement. Three of the 4 cases presented had papillary carcinomas and only 1 case had a solid infiltrating cancer.

Fig. 1. Extensive bone destruction from papillary carcinoma of the bladder involving upper third of the femur, the acetabulum, and the inferior ramus of the ischium. (Courtesy of American Journal of Surgery.)

A study of the histology of the primary tumor in 27 cases (23 cases collected from the literature and the 4 cases presented) suggests that large osteolytic bone metastases seem to develop more frequently in cancers of the papillary type than in the group of solid infiltrating carcinomas. This observation is in contrast to the fact that general carcinosis is encountered more frequently in solid infiltrating cancers of the bladder. ROBERT P. MONTGOMERY, M.D.

Barnes, A. C.: The Roentgenological Study of Urethral Sphincter Strength in the Female. *J. Urol.*, Balt., 1942, 47: 694.

The technique and interpretation of an x-ray examination which has been found helpful in the study of women with partial urinary incontinence

are presented by the author. The method of study, based on 100 examinations during the past two years, consists in determining, by roentgenological means, the ability of the urethral sphincter to resist pressure. The goal was to assess varying degrees of sphincteric weakness and classify the patient's disability more accurately.

The apparatus used was simple, not time-consuming, and in contrast to other means of urethrography in the female, gave physiological rather than anatomical findings. It is composed of three parts: a small rubber balloon which is placed in the urethra and filled with a radiopaque dye, a manometer to record the pressure within the balloon, and a Luer syringe to fill the system. The normal urethral sphincter mechanism can compress this type of balloon up to 32 cm. of water. At increasing pressures, however, the urethral sphincter will be forced open; also, at the so-called normal pressure of 32 cm. of water, torn or weakened sphincters will be forced open.

The author believes that this test provides an additional factor on which a decision may be based regarding patients in whom the clinical picture is not clear-cut or in whom the therapeutic program cannot be established easily. It does not replace, but rather complements other methods of evaluating sphincter function. Its greatest value, he believes, lies in eliminating patients unlikely to be benefited by operation. Further, postoperative studies permit an evaluation of the effectiveness of the operation employed. ARTHUR H. MILBERT, M.D.

GENITAL ORGANS

Miller, M. L.: The Neutral Steroids in the Urine of Individuals with Benign Hypertrophy of the Prostate. *J. Urol.*, Balt., 1942, 47: 846.

Although it is recognized that the physiologically active sterols found in the urine are not necessarily representative of the sex-hormone activity in the body, nevertheless, since in certain pathological states (as in cases of adrenocortical tumor) relatively large amounts of an abnormal hormone have been isolated from the urine along with greatly enhanced amounts of normal hormone, an investigation was undertaken of the neutral steroids in the urine of persons with benign hypertrophy of the prostate.

Twenty-eight different patients with benign prostatic hypertrophy contributed 144 liters of urine which was subjected to extraction and fractionation. The technique of extraction and fractionation is presented in detail. The study yielded no evidence for the occurrence, in any substantial amount, of an abnormal hormone. Androsterone, 3-chloro Δ^5 androsterone-17, cholesterol, and the urinary hydrocarbon, which were isolated and identified, are all, with the possible exception of the last, normal constituents.

The author emphasizes that observations on the urine of persons with benign hypertrophy of the prostate quite possibly represent merely the effect of age on the neutral steroids in male urine. Comparison with similar studies on normal men and eunuchs indicated an appreciably smaller amount of androsterone, but no significant differences in the amount of transdehydroandrosterone.

ARTHUR H. MILBERT, M.D.

Herger, C. C., and Sauer, H. R.: Further Observation on Serum-Acid-Phosphatase Activity in Carcinoma of the Prostate. *Cancer Research*, 1942, 2: 398.

Serum-acid-phosphatase determinations carried on by the authors in 430 patients over a period of two years have yielded interesting and informative data. Of the 430 patients studied, 147 had carcinoma of the prostate while 283 did not, the latter being used as controls. A brief review of the work of Barringer and Woodard, Gutman and Gutman, and Huggins is presented as a preface to the present study.

Serum-acid-phosphatase determinations, in the opinion of the authors, are a valuable diagnostic aid in the early recognition of bone metastases from prostatic cancer in new patients and in those who are under constant observation. Serum-acid-phosphatase levels up to 4.0 King-Armstrong units should be considered normal. Values from 4.0 to 6.0 units represent borderline figures which are only diagnostic for metastatic bone lesions from carcinoma of the prostate if further elevation takes place. A considerable rise in the serum-acid-phosphatase activity is indicative of bone metastases from prostatic cancer. With one exception, such an elevation was not encountered in the group of controls or in patients not suspected of having bone metastases from carcinoma of the prostate.

If elevation of the serum-acid-phosphatase activity develops, there is a tendency to steady increase provided no effective treatment is initiated. A relationship between the degree of serum-acid-phosphatase elevation and the extent of metastatic bone involvement could not be established in this series, although values of more than 100 King-Armstrong units must be regarded as unfavorable prognostic signs.

It is emphasized that the determination of serum-acid-phosphatase activity is also of value as an objective indicator of the effectiveness of castration or stilbestrol in the treatment of prostatic cancer, as suggested by Huggins and his coworkers. This is true especially for patients with metastatic bone lesions which cause elevation of the serum-acid-phosphatase activitv. ARTHUR H. MILBERT, M.D.

Prince, C. L.: Malignant Tumors of the Spermatic Cord. A Brief Review with Presentation of a Case of Angioendothelioma. *J. Urol.*, Balt., 1942, 47: 793.

The author reports a case of malignancy of the spermatic cord, which is the 75th reported in the literature. Seventy-four of the cases were mesodermal in origin (sarcomas and carcinomas). There has

been some dispute in the literature concerning the origin and classification of these tumors, but the author quotes the following classification of Hinman and Gibson as being ideal:

A. Benign
   1. Epithelial
   2. Mesoblastic
      a. Lipoma
      b. Fibroma
      c. Myxoma
      d. Leiomyoma
      e. Vascular tumors (lymphangioma)
   3. Heterologous
      a. Cystic dermoid

B. Malignant
   1. Epithelial
   2. Mesoblastic
      a. Sarcoma (myxosarcoma, chondrosarcoma, fibrosarcoma, spindle cell)
   3. Heterologous
      a. Teratoma (including seminoma of Chevassu)

The author emphasizes the fact that all cord tumors should be explored and studied microscopically by frozen section. If found malignant, the epididymis, testicle, and all of the cord possible should be removed and deep x-rays exhibited. It is not considered necessary to employ the radical operation of Hinman for these tumors, which as a group are not transmitted by the lymphatics. However, it is pointed out that little is known of the outcome of these cases since the literature does not disclose their outcome and additional information is sorely needed along these lines.

The case reported is that of a sixty-three-year-old white male who was admitted to the University of Virginia Hospital at Charlottesville on June 30, 1933. The patient presented a right scrotal tumor of some fourteen months' duration; however, only in the preceding three months had the mass grown rapidly. The physical examination revealed the mass to be associated with the upper portion of the testicle. The tumor was firm, non-tender, slightly nodular, spheroidal in appearance, and approximately 5 cm. in diameter. The laboratory studies revealed nothing unusual; they included a series of x-ray studies of the body.

The entire cord and testicle was removed at operation soon after admission and microscopic study of the tumor revealed it to be an angioendothelioma of the spermatic cord with extension to the connective tissue of the cord at the point of division.

The patient enjoyed an uneventful convalescence and was followed up at regular intervals for two years. In 1935 he noted blindness and protrusion of the right eyeball. This was further associated with paralysis of the extraocular muscles. It was believed to be due to metastasis and treated with deep x-rays, just as the operation was followed with deep x-ray treatment. The eyeball soon receded and although vision was not restored the patient had no further recurrence when last heard from some eight years following the operation. ROBERT LICH, JR., M.D.

MISCELLANEOUS

Deibert, A. V., and Greenblatt, R. B.: Malignancy and Lymphogranuloma Venereum. *Am. J. Syph.*, 1942, 26: 330.

The authors presented the case of a twenty-four-year-old negress with a lymphogranulomatous process of long standing. In addition to an elephantiasis of the left vulva there was an associated rectal stricture and a highly vascular, grayish, indurated ulceration of the right posterior vulva and labium majus in which there was found an epidermoid carcinoma. The authors speculated as to the relationship of the lymphogranulomatous lesion to the malignancy and pointed out that the frequency of this occurrence is unquestionably beyond the bounds of mere coincidence.

In this particular instance it was pointed out that the age of the patient, the chronicity of the venereal disease, and the histopathology of the biopsy specimen led to the assumption that the malignancy was directly related to the lymphogranuloma venereum.

It was emphasized that this case suggested the importance of histopathological studies of ulcerative processes which occur in conjunction with venereal disease and especially with lymphogranuloma venereum. ROBERT LICH, JR., M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Horwitz, T.: The Effect of Sulfanilamide Crystals, Used Topically, on the Fate of Transplanted Bone. *Surgery*, 1942, 11: 690.

Sulfanilamide and its derivatives are being employed in bone and joint surgery as a prophylactic measure to prevent the relighting, by the trauma of surgical intervention, of a pre-existing, quiescent infection. This measure has also been suggested as a routine step in surgery of clean bone and joint cases without any history of preceding infection.

Although the use of local chemotherapy has been recommended in bone-grafting procedures, the use of the sulfonamide compounds in this field of surgery will depend, among other things, upon proof that these drugs are not deleterious to the normal process of incorporation of a bone graft by the host bone. The purpose of this communication is to offer experimental evidence and some clinical proof that the local use of sulfanilamide in powder form has no adverse effect on the fate of transplanted bone.

The topical application of sulfonamide compounds as prophylactic bacteriostatic agents in bone-graft surgery of potentially infected or even contaminated cases may serve to insure better anatomical and functional end-results over a shorter period of time. The clinical trial of this measure will be dependent upon proof that the sulfonamide drugs, when employed topically, are not deleterious to the normal process of incorporation of transplanted bone by host bone. Experimental observations in 18 rabbits and a limited clinical experience with 5 human cases indicate that the local implantation of sulfanilamide crystals has no apparent adverse effect on the fate of transplanted bone.

The topical application of these compounds insures a high local concentration in the tissues. When the systemic administration of sulfanilamide may produce a concentration of from 10 to 15 mgm. per cent in the blood and tissue fluids, the local implantation of the crystalline powder of this drug, the most soluble of the sulfamides, makes possible a saturated solution and produces a concentration of from 800 to 1,000 mgm. per cent (Jensen, Johsrud, and Nelson; Key and Burford; Stuck, Maxwell, and Monsalvo). This concentration of the drug is not limited to the wound itself but extends into the surrounding tissues and remains constant until the drug is entirely absorbed. This concentration in the wound lasts approximately forty-eight hours, that is, until the drug is completely absorbed and excreted. It is probable that the concentration of sulfathiazole and the other less soluble sulfonamides lasts longer (Key, Key and Burford). The only dangers in the topical administration of the sulfonamides are the possibility of some interference with wound healing, especially if an excessive amount of the drug is used, and of the uncontrollable toxic reactions in susceptible individuals.

In those wounds in which the sulfonamide drugs were implanted locally, the fibroblastic reaction of the paraosseous tissues appeared excessive. This was possibly an expression of reaction to the crystalline foreign substance, although other evidences of foreign-body reaction, such as inflammatory cells and giant cells, were not evident. Crystals of the implanted drugs were not evident in the specimens as early as two weeks postoperatively.

Eighteen adult rabbits were operated upon under ether anesthesia. In each of 6 animals a graft was removed from one tibia and transplanted to a prepared bed in the opposite tibia, while a graft from the latter tibia was transferred to the former limb. One wound, serving as a control, was closed in layers without the local use of any drug. The other wound was packed (the bone graft surrounded with sulfanilamide crystals in 4 rabbits and with sulfathiazole crystals in 2 rabbits) and then it was closed in layers. In 2 animals this procedure was pursued without the use of any drug in either leg. In 2 rabbits, a segment was resected from one ulna and was transplanted to an identical defect in the opposite ulna, and then this step was reversed, the radius acting as a splint for the extremity. Sulfanilamide crystals were packed into the wound of one limb, after closure of the opposite control wound into which no drug had been introduced. In 8 rabbits bone was transplanted from the iliac crest to prepared sites on both tibias, one leg wound being packed with sulfanilamide crystals in 7 animals and with sulfathiazole crystals in 1 animal, after closure of the opposite control wound into which no drug had been implanted.

The powdered drugs were not sterilized. No postoperative fixation was employed other than firm adhesive dressings. The animals were killed at intervals of one, two, four, six, and eight weeks following operation, and the operated bones were removed, roentgenographed, and examined histologically.

ROBERT P. MONTGOMERY, M.D.

Meyerding, H. W., and Clegg, R. S.: Modern Treatment of Osteomyelitis. *Am. J. Surg.*, 1942, 57: 56.

Several factors must be taken into consideration for the determination of the type of treatment indicated in an individual case of osteomyelitis, namely, the duration of the disease, the site and extent of the lesion, the causative organism, and the general condition of the patient. There are few contraindications to the usual supportive measures such as complete rest in bed, immobilization of the affected part, the use of analgesics, sulfonamides, and the abundant ingestion of fluids. There is some difference of opinion, however, regarding the advisability

of surgical intervention in cases of acute osteomyelitis. Although most authors still advocate immediate incision with drainage and the instillation of petrolatum packs (Orr's method) or dakinization, some believe that incision of the periosteum and soft-tissue abscess is preferable.

Recent studies have revealed the increasing value of chemotherapy as an adjunct in both the conservative and the operative treatment of osteomyelitis. Sulfanilamide and sulfathiazole should be used for the prophylaxis of severe wounds and compound fractures, in cases of osteomyelitis in which operation is contraindicated or refused, in preoperative and postoperative treatment, and in cases in which a fulminating infection is associated with septicemia.

Sulfanilamide apparently is more effective than sulfathiazole in the treatment of infections caused by streptococci, while sulfathiazole is the drug of choice in the treatment of staphylococcic infections. These drugs are especially effective in cases in which septicemia is a complicating factor. They may be safely and effectively administered orally in the form of tablets, each containing 7½ gr. (0.5 gm.). Ninety grains (6 gm.) should be administered in 6 doses. This amount usually will maintain a concentration of 10 mgm. of the drug in each 100 cc. of blood. Some physicians advocate the administration of huge doses of these drugs during the first twenty-four hours, that is, until the concentration of the drug in the blood reaches between 20 and 30 mgm. per 100 cc., and the maintenance of this concentration for two or three days, after which the amount is to be decreased progressively in proportion to the progress of the patient. It is too early to evaluate definitely the efficiency of this plan of therapy. The local administration of from 10 to 15 gm. of the powdered drug is indicated as an adjunct in the treatment of open wounds. These drugs can be injected into the sinuses or cavities when mixed with cod-liver oil; 5 gm. of either drug is blended with 30 cc. of the oil. Either sulfanilamide or sulfathiazole can be used in a standard 0.8 per cent solution for the irrigation of wounds. The use of this type of treatment varies according to the type of infection and the individual response to the drug used. In cases of septicemia in which treatment is adequate, the recovery rate is between 70 and 75 per cent.

The authors believe that sulfonamides have proved of inestimable value in the treatment of septicemia and acute osteomyelitis. Blood cultures taken before localization of the lesion of the bone and adequate chemotherapy may prevent osteomyelitis with its complications and septicemia with fatal results. When large abscesses have formed, it is the authors' opinion still that adequate surgical drainage of the infected region is indicated.

Alexander, L. J., and Schoch, A. G.: Osseous Syphilis. *Am. J. Syph.*, 1942, 26: 307.

The authors present 2 cases of bone lesions, the first involving the skull and femur; the second involving the cervical vertebrae. Because of a clerical error a negative serology was reported in the first case, but after tests for all other bone conditions were returned as negative, the serology test was repeated and found to be positive. Dramatic relief followed the specific therapy.

The second case presented a typical picture of cervical Pott's disease with retropharyngeal abscess. Because of the positive serology specific measures were instituted and the rapid response precluded the necessity of using measures usually employed in the treatment of tuberculosis of the cervical vertebrae.

DANIEL H. LEVINTHAL, M.D.

Fulton, M. N., and Sosman, M. C.: Venous Angiomas of the Skeletal Muscle. *J. Am. M. Ass.*, 1942, 119: 319.

An angioma is a tumor, usually benign, composed of vascular channels and spaces, and arising in various areas of the body. The authors report 4 cases of angioma occurring in skeletal muscle.

Case 1. Venous angioma of the right arm just above the elbow. There were recurrent attacks of pain and swelling for thirteen years. The diagnosis by roentgen examination was confirmed by the injection of diodrast. Roentgen therapy was administered.

Case 2. Venous angioma of the left arm just above the elbow previously diagnosed as a fatty tumor. Persistent nontender swelling had been present for sixteen years. Diagnosis was made by roentgen examination. Surgical excision was done.

Case 3. Venous angioma of the left forearm and hand with involvement of the phalanges and metacarpal bones. There had been enlarged veins of the fingers, hand, and forearm since birth. Periodic swelling followed exercise. Diagnosis was made by roentgen examination. Roentgen therapy was administered.

Case 4. Venous angioma of the sole of the right foot with symptoms of four years' duration and development of phleboliths during this interval. Diagnosis was made by roentgen examination. Surgical exploration was made, which was followed by roentgen therapy.

In all 4 of these cases of venous angioma of the skeletal muscle, the diagnosis was made by the roentgen-ray demonstration of phleboliths in the tumor. Radiopaque material is of value in delineating the extent of the tumor. Early surgical excision is the treatment of choice, but when inadvisable or impossible, roentgen therapy may be of benefit and should be tried.

EARL GARSIDE, M.D.

Jaffe, H. L., and Lichtenstein, L.: Solitary Unicamerate Bone Cyst, with Emphasis on the Roentgen Picture, the Pathological Appearance, and the Pathogenesis. *Arch. Surg.*, 1942, 44: 1004.

Solitary unicamerate (having 1 cavity) bone cyst is an independent and distinctive lesion. It bears no relation to giant-cell tumor of bone, and, in particu-

lar, it does not represent a cystic-healing phase of this tumor. It should not be confused with enchondroma, fibroma, or focus of fibrous dysplasia of bone which has undergone partial or extensive cystic degeneration. It should not be regarded as representing the cystic expression of osteitis fibrosa.

The lesion usually begins its development in the shaft, at or near an epiphyseal cartilage plate, of some one of a few predilected long tubular bones. In any representative series of cases, about half of the lesions are located in the upper humeral shaft, and this region, together with the upper femoral shaft, will account for fully two-thirds of all of the cases. The cyst is usually already large and well developed when attention is first drawn to its presence—usually by an infraction of the attenuated cortex. Anatomically, the lesion presents itself as a unicamerate cavity filled with fluid and delimited by a thinned and often distended shaft cortex. The inner surface of this cortex, roughened and sometimes distinctly ridged, is lined by a rather thin connective-tissue membrane which usually yields little material upon curettement. On microscopic examination, this material is found to consist mainly of fibrin clots containing some red blood cells and undergoing organization and even calcification and ossification. In an occasional case it also contains some cholesterol crystals, with or without nests of multinuclear giant cells and lipoid and hemosiderin-containing phagocytes.

Regarding pathogenesis, the authors favor the view, already proposed by Mikulicz, that the lesion has its basis in a local disorder of development and bone growth, rather than, as proposed by Pommer, in a local intramedullary hemorrhage resulting in the development of an encapsulated pressure cyst from the continuous transudation of fluid into the area. The authors have tried to show also that the natural life cycle of the cyst has two stages. The first stage, that of active growth, persists as long as the cyst remains abutting on the epiphyseal cartilage plate. This stage is usually interrupted when an area of substantia spongiosa becomes reconstructed between the plate and the cyst in the course of healing of a spontaneous fracture. The cyst is then in the second stage, the latent or static, in which, while tending not to increase in size, it moves farther away from the plate as the longitudinal growth of the bone progresses.

Whether in the growing or in the static stage, solitary unicamerate bone cysts are amenable to operative cure by curettage and filling with autogenous bone chips. If the cyst is in a latent stage, it is almost sure to show prompt obliteration in response to this treatment. If the cyst is still in its growing stage, it is often likewise quickly obliterated. However, particularly large cysts in the growing stage, or cysts which have been irradiated before being operated on, may fail to fill in completely and promptly and occasionally require a second intervention. It appears that spontaneous healing of solitary unicamerate bone cysts occurs much less frequently than is commonly supposed. Radiation therapy by itself never leads to healing of the type of cyst in question and seems even to be contraindicated as an adjuvant to surgical intervention.

Attention is also called to the rarity of solitary unicamerate cyst in other than long tubular bones and to a peculiar type of blood-containing cyst which is described under the heading of aneurysmal cyst. ROBERT P. MONTGOMERY, M.D.

Charache, H.: Tumors of the Tendon Sheaths. *Arch. Surg.*, 1942, 44: 1038.

Tumors of the tendon sheaths, excluding ganglion, are rare. The author reports 65 cases, 60 of ganglion, 2 of lipoma, 1 of hemangioma, 1 of fibroma, and 1 of spindle-cell sarcoma.

Because of the rarity of these tumors and the lack of information on the subject in modern textbooks, a complete review of the literature was made, and the following classification of tumors of the tendon sheaths was evolved: benign—ganglion, xanthomatous giant-cell tumor, lipoma, hemangioma, lymphangioma, fibroma, osteochondroma;

Malignant—synovioma, spindle-cell sarcoma, chondrosarcoma.

Ganglion is a benign cystic neoplasm containing mucinous or gelatinous material which is the product of collagenic degeneration. It arises from the connective tissue of the joint capsule or the tendon sheath. This view was first brought out by Clarke in 1908, was accepted by many writers, and was included in Dean Lewis' report of 40 cases of ganglion in 1934. Occasionally, ganglion may arise from the joint capsule and invade the tendon sheath by contiguity, without communicating with either cavity.

The tumor is most prevalent during adolescence and early adult life and occurs more frequently in females. The treatment of choice is complete surgical excision of the ganglion. The treatment of ganglion by the injection of sclerosing solutions has been tried with some success in isolated instances.

Next to ganglion, the xanthomatous giant-cell tumor is the most common growth found in the tendon sheath. In more than 50 per cent of the cases, it is located in the tendon sheaths of the fingers at the metacarpophalangeal or interphalangeal joint near the tendinous insertion or next to a sesamoid bone. Diagnosis is difficult since the symptoms and signs are not characteristic of this tumor alone. Roentgen examination may reveal some fibrocartilage and bone trabeculae in certain cases only. Xanthelasma of the skin in other parts of the body and hypercholesteremia may be found in some cases. The treatment is complete excision. The prognosis is good; recurrence is rare. The tumor, according to Ewing and many others, does not metastasize. However, Ragins found 6 cases in the literature in which bone was invaded. Three additional cases were reported by Geschickter and Lewis.

Lipoma of the tendon sheaths occurs in two forms: the simple lipoma, which often occurs symmetrically in both hands and usually involves a single tendon

sheath, and the arborescent type, which is analogous to the fat of the appendices epiploicae and which because of its arborescence involves more than one tendon sheath. The latter is the more prevalent. Histologically, the arborescent type contains more fibrous tissue and is more vascular but is otherwise indistinguishable from any other lipoma.

The extensor tendons of the hands and the feet are most commonly involved. The former are twice as frequently involved as the latter. The majority of the patients are male and between the ages of fifteen and thirty.

Diagnosis is difficult; in only 3 cases has the diagnosis been made before operation. The tumor is soft, sometimes giving a strong suggestion of fluctuation. It may become firmer in consistency when it is chilled with an ice bag. This has been employed as a diagnostic aid in a number of cases. Some roentgenologists are able to differentiate lipoma from other soft-tissue shadows.

Treatment is complete surgical removal. In most cases part of the tendon sheath has to be removed with the tumor.

The prognosis is good. Recurrence seldom takes place when the tumor is completely removed. The arborescent type is more likely to recur, because one or more of its ramifications may be left behind.

Hemangioma of the tendon sheath varies considerably in size and shape. It decreases in size when the extremity is elevated or when it is compressed with the fingers. It increases in size in the dependent position or on circular compression of the limb. The overlying skin is freely movable and takes a deeper purplish hue during the dependent position or circular compression. The tumor moves with the movement of the involved tendon. Occasionally one can palpate the angiolithic concretions within the tumor. The tumor itself feels cystic on palpation. The concretions show up well on x-ray examination.

Complete surgical excision is the treatment of choice, and no other treatment can be substituted for it. The prognosis of angioma of tendon sheaths is good. The rarity of recurrence, of functional disturbance, or of malignant transformation bespeaks its results.

Only 5 cases of lymphangioma of the tendon sheath were found in the literature by Harkins in 1937. There has been no other case reported up to the time of writing. The clinical course differs little from that of hemangioma.

Fibroma of the tendon sheaths is a small circumscribed firm nodule, not adherent to the skin but intimately attached to the tendon sheath, simulating subcutaneous fibroma in any other part of the body. In some instances, it is associated with multiple neurofibromatosis. It does not recur after complete excision. Because of its circumscribed nature, it lends itself to complete excision more readily than any other tumors in this region. Part of the tendon sheath has to be excised with the tumor.

Osteochondroma of the tendon sheath usually arises near the osseous insertion of the tendon, where precartilaginous tissue normally exists. It varies in size from that of a cherry to that of a hen's egg, and interferes with the movements of the tendons, which results in pain. The majority of cases occur during adult life. The hands and feet are most commonly involved. The treatment is complete excision. Part of the tendon sheath and, in some instances, even part of the tendon may have to be sacrificed.

Grossly, synovial tumors (synovioma) are of soft consistency, even fluctuating at times, although some are reported as being firm. They vary in size from that of a walnut to that of an orange. In the larger tumors, the overlying skin may be infiltrated and even ulcerated. The superficial veins are markedly dilated. The cut surface is grayish white or brownish, and shows cystlike cavities containing brownish or yellowish fluid. In describing the gross appearance of the tumors, Jonsson stated: "It is striking how the operator received more the impression of a chronic inflammatory process than a tumor."

The clinical course of synovioma is the same, whether it occurs in the joint capsule, the tendon sheath, or the bursa. The diagnosis is most difficult. Subjective symptoms are few. The pathologist is usually the one who makes the diagnosis after removal of the tumor, and this he does after a great deal of deliberation and study.

Early high amputation is the treatment of choice. Coley and Pierson stated that any operable tumor which by its location suggests the probability or even the possibility of synovioma should be removed by wide excision followed by roentgen therapy after the diagnosis is confirmed by the pathologist. In the event of recurrence, they recommended prompt amputation, provided the lungs are free from metastasis. Although they agreed that the tumor is not radiosensitive, they recommended radiation therapy for postoperative and nonoperative treatment.

The prognosis of synovioma, as given by Coley and Pierson, is 20 per cent five-year cures and 40 per cent three-year survivals.

Spindle-cell sarcoma and chondrosarcoma are among the rarest of all tendon sheath tumors.

ROBERT P. MONTGOMERY, M.D.

Kelly, M.: New Light on the Painful Shoulder. *Med. J. Australia*, 1942, 1: 488.

The results in 32 cases of painful shoulder are briefly summarized.

In spite of variations in the severity of the symptoms and the mode of onset, a remarkably constant clinical picture is presented in the well developed case. The main features are: pain in the shoulder on abduction of the humerus, severe aching at night, and tenderness on the "point" of the shoulder. The pain on movement may be of all grades of intensity, from a severity which limits all movement, to a twinge which is felt when the humerus is near the horizontal while it is being raised or lowered. It is usually felt near the insertion of the deltoid muscle rather than in the joint itself, although it may radiate widely. The aching at night is usually the

patient's chief complaint. Usually there is a point of tenderness on the greater tuberosity, which disappears under the acromion on abduction (Dawbarn's sign). This sign may be absent, or tenderness may be more widespread over the deltoid region.

In less than half of the cases the patient gives a history of an injury to the shoulder; this usually takes the form of a fall on the outstretched arm or the point of the shoulder (stubbed shoulder). When the pain follows an injury, there is usually an interval of a few days before it manifests itself.

In all, the author has encountered 16 cases in which complete cure resulted from injections into the trapezius muscle (or, as seems more probable, the supraspinatus or levator anguli of the scapula, which are situated directly beneath the trapezius). In an additional 6 cases the pain was of a different type; these cases will be considered later under the heading of "brachial neuritis." In many of the cases in which cure was not obtained, it was possible by infiltration completely to relieve all pain for the time being. In some this relief lasted for some days, but the pain returned, and further injections did not give permanent benefit. In about half of the 32 cases a roentgenographic examination was made; calcification in the tendons was found in only 1, and in this case 1 injection effected a cure.

In many cases a single injection was successful; in those in which further injections were required a good prognostic sign was a decrease in the symptoms after the first injection, or a change in the character and distribution of the pain. If the latter occurred, it was often found that a new lesion had formed in a new situation, and treatment as a rule was ultimately successful.

Before infiltration of an area it is interesting to try the effect of flat pressure over the affected area of the trapezius muscle. In nearly every case the pain on abduction is either completely abolished or considerably reduced, to return when the pressure is removed. After a wheal has been raised on the skin, the tender area is well infiltrated. It is interesting to put the patient through his movements immediately, and find that the pain either has disappeared or has changed for the better. In the latter case, the lesion will be found on thorough palpation to display some tenderness. When this has been abolished, the movements of the shoulder will be practically painless. Sometimes as much as 20 cc. of a 1 in 1,500 solution of percaine, or a 1 in 200 solution of novocaine is necessary. The injection is often painful, and the patient will frequently faint if he is not instructed to lie down beforehand. During the period under review, about 10 cases were encountered in which infiltration proved unsuccessful after a prolonged trial. The author's impression now is that if no alteration in the symptoms occurs after two thorough infiltrations, further perseverance will prove ineffective.

In some cases the pain was felt from the neck region to the finger tips. The cases in which there is no limitation of pain on movement can be sharply differentiated from the cases of true shoulder disability. These cases appear to be naturally divided into two groups: (1) those of brachial neuritis in which the usual shoulder syndrome is present, but an additional lesion is present in the forearm, and (2) those in which neuralgic pain, independent of shoulder movements, is felt in the whole arm. It is usually found that the area of maximum tenderness is in the region of the seventh cervical or the upper three thoracic spines. In some of these cases pain is felt on movement of the neck, and it would seem that the lesion is situated beneath the trapezius in the splenius muscle. The tips of the spines may be excessively tender, but the infiltration should be made in the soft tissues close to the spine.

As a rule the signs and symptoms of fibrositis in general are pain and tenderness referred from a small lesion, which can be recognized as a circumscribed area of tenderness in muscular tissue. The tenderness may be referred some distance away, and is more likely to be situated over bony points or ligaments, while the pain is frequently referred to joints. The referred tenderness is often more acute than that of the lesion. Thus the observations described correspond with similar observations upon fibrositis in other parts of the body, and suggest that in many cases of shoulder disability the signs and symptoms are secondary to a muscular lesion in or beneath the trapezius muscle.

The tissues between the head of the humerus and the acromion are remarkably subject to attrition, and it is not surprising that degenerative changes should be found in the tendon of the supraspinatus. It is not surprising either that calcium salts should be deposited occasionally in these degenerated tissues. Keyes and others (including Codman himself) have shown that rupture of the supraspinatus is found in more than 20 per cent of the subjects dead from the common diseases of old age, and Bosworth has shown that calcification is found in the region of the shoulder in from 2 to 7 per cent of normal people. The presence of calcification would then render the shoulder somewhat more liable to a painful lesion, and once the lesion was established, it would tend to delay its recovery.

A weakened supraspinatus tendon would be more liable to rupture or be injured on strenuous effort. However, there seems to be no scientific proof of the contentions that an intact supraspinatus muscle is essential for abduction of the shoulder, or that an old rupture of the tendon should of itself be more likely to cause intractable pain than an old rupture of a tendon anywhere else.

Local anesthesia is both an instrument of research and a therapeutic weapon. The persistence of the cure into the postanesthetic stage has not yet been satisfactorily explained. Suffice to say at this stage that a focus of irritation causes pain and tenderness in the region of a joint by reflex action, and that the disintegration of this focus is followed by cure. Local anesthesia for painful shoulders has been recommended by several men. As most of these

workers recommend infiltration of the tender areas over the head of the humerus, there is no doubt that disappointment must often be their lot. Most of them speak of severe reactions and repeated injections. Codman states that local anesthesia is good only in acute cases. In the majority of acute cases, however, recovery occurs quickly without treatment. It seems to be generally agreed that, with or without treatment, eventual recovery is the rule after months or years. Codman states that while even in the worst cases of frozen shoulder recovery occurs with little disability, recovery without operation cannot be expected when the tendon has ruptured. His opinions regarding periarthritis are supported by Dickson and Crosby, who reviewed 200 cases, and by Rogers, who studied 100 cases; but Douthwaite is emphatic that periarthritis has no tendency toward spontaneous recovery, and that manipulation is necessary to break down adhesions. Here again the truth probably lies somewhere between the two extremes, and the sound conservatism of Robert Jones is to be recommended. His procedure is as follows:

1. Immobilize the joint in abduction until the inflammatory reaction has subsided.

2. Manipulate the joint to break down any adhesions.

3. Institute re-educative exercises when movements are freed. Exercises in the presence of pain, as practiced by many authorities, do little good, and the various forms of heat therapy are merely palliative. In less severe cases with no tendency toward adhesions, it is often impracticable to immobilize the joint, and the patient makes a slow recovery after suffering considerable discomfort. Patterson and Darrach and Wilson have recommended irrigation of the subacromial bursa. Under local anesthesia the calcified deposits can be washed out through a wide-bore needle. Here again, Codman, after reviewing the subject, said that the method was good in acute cases only. It appears to Kelly that the disappearance of the deposits would be due to the resultant hyperemia and absorption rather than to physical means. Deposits have frequently been observed to absorb spontaneously within a short time (Bosworth, Codman). Patterson and Darrach state that the method is equally good in the absence of calcification, when gelatinous material comes through the needle. However, one's sense of proportion is restored on hearing that Milgram (quoted by Wilson) has obtained equally good results from simple puncture with a needle. Nearly all authorities agree that operation to remove calcified deposits is a certain method of cure, but Wilson holds that it is of value only in the acute type of case, and, moreover, the deposits are not common enough to be of great importance.

The successful results described should not be surprising in view of the previous researches into the nature of fibrositis. The painful symptoms as a rule represent the reflex effect of stimulation of a distant focus, which is usually situated in muscular tissue. The tenderness is the result of the liberation from the tissues of a substance which renders them more sensitive. The symptoms of fibrositis are in large measure due to a nocifensor or trophic nervous reflex.

ROBERT P. MONTGOMERY, M.D.

Chont, L. K.: A Roentgen Sign of Early Suppurative Arthritis of the Hip in Infancy. *Radiology*, 1942, 38: 708.

The causative agents of secondary suppurative arthritis are the streptococcus, staphylococcus, pneumococcus, meningococcus, and gonococcus. Early suppurative arthritis may result from even a mild upper respiratory infection, an insignificant furuncle, pneumonia, osteomyelitis, or meningitis.

The general clinical symptoms are increasing prostration, fever, and leucocytosis. The local symptoms are pain, swelling, and impaired function of the hip followed by muscle spasm, loss of the gluteal fold, and flexion of the thigh.

Although aspiration of the joint can serve as a differential diagnostic aid in true intracapsular cases, careless aspiration of a periarticular infection might inoculate the joint cavity. Roentgen examination is a safe diagnostic procedure and gives reliable information as to the extent of the disease and the approximate amount of intracapsular fluid, both hips to be on the same roentgenogram for comparison.

Fig. 1. A, Lateral and upward displacement of right femur. B. Same case after aspiration of joint.

One of the outstanding roentgen signs is displacement of the femur. Lateral and upward subluxation or displacement of the femoral head occurs as a result of the increase in intracapsular fluid. Destruction of the articular cartilages often occurs, and there may be periosteal elevation. Soft-tissue swelling is often pronounced. The femoral head may be absent.

A detailed report is made of 6 illustrative cases. Figure 1A demonstrates the lateral and upward displacement of the right femur which occurred in a sixteen-month-old boy, who had apparently been well until five days before admission, when a limp developed. Subsequently, the thigh became swollen, tender, and hot, and a fever of 104.2 degrees developed. Figure 1B shows the appearance of the hip after aspiration of 1½ oz. of thick yellow pus.

HAROLD C. OCHSNER, M.D.

Schein, A. J., and Arkin, A. M.: Hip-Joint Involvement in Gaucher's Disease. *J. Bone Surg.*, 1942, 24: 396.

Eight cases of Gaucher's reticuloendothelial disease with hip-joint involvement are presented in addition to a review of the reported cases. The skeletal changes are attributed to infiltration and replacement of the bone trabeculae by kerasin-bearing reticulum cells, appearing roentgenologically as translucent mottled areas, most typically in the lower part of the femur. The spleen, liver, and lymph nodes are also involved and diagnosis is usually confirmed by sternal or splenic aspiration which reveals the typical Gaucher's cells microscopically.

In the hip joint, the early lesions may be mistaken for chronic osteomyelitis, tuberculous arthritis, or Legg-Calvé-Perthes' disease. With continued weight-bearing collapse and aseptic necrosis of the head may occur. Coxa-vara formation, irregularity of the epiphyseal plate, and pathological fracture of the neck sometimes occur in children. Later, osteoarthritic changes are superimposed.

The onset may be accompanied by fever, leucopenia, anemia, pigmentation of the skin, painful hip, and enlarged liver, spleen, and lymph nodes. Symptoms recur at intervals with intervening periods during which the patient is symptom-free. Bed rest, traction, immobilization and roentgen therapy help to prevent deformity, and in several cases have enabled regeneration of the femoral head, as in Legg-Calvé-Perthes' disease. Arthrodesis in advanced cases of hip involvement is not always feasible because of the danger of hemorrhagic complications.

Three cases of hip disease in children are presented, all confirmed by sternal or splenic aspiration. In 2 there was regeneration of the head; the third case necessitated hip spica immobilization. The remaining cases occurred in adults, 2 of them being sister and brother. One had severe involvement of the spine with gibbus formation, and of the pelvis, femora, humerus, and radius. Post-mortem examination revealed heterotopic bone-marrow formation in the liver, and the extensive bone involvement was believed to be due to splenectomy in early life.

DANIEL H. LEVINTHAL, M.D.

FRACTURES AND DISLOCATIONS

Houkom, S. S.: Recurrent Dislocation of the Patella. A Study of End-Results in 27 Cases. *Arch. Surg.*, 1942, 44: 1026.

The treatment of recurrent dislocation of the patella has been a fertile field for the growth and development of surgical ingenuity. As many as 60 different operative procedures have been devised for its correction. This study of 27 dislocating patellas treated at the New York Orthopaedic Dispensary and Hospital confirms the authors belief that one or two types of procedure, either separate or combined, are sufficient to give a stable symptomless knee. This is true for all types of cases. It is important also to emphasize relatively early operative treatment, since osteoarthritis is prone to occur sooner in the presence of this condition than in a normal knee.

In this group of patients, the age at operation varied from four to twenty-two years. Most of the patients were operated on when between twelve and twenty years of age. Thirteen patients waited anywhere from six months to eleven years before operation was done. The average period between the onset of dislocation and operation was four and three-tenths years.

The operation most commonly performed in treating these patients at the New York Orthopaedic Dispensary and Hospital is transplanting the tibial tubercle with the attached patellar tendon. This operation has been used at the New York Orthopaedic Dispensary and Hospital since 1932. It was done on 23 knees. In this operation, the tibial tubercle with the attached ligamentum patellae is removed as a block of bone and transplanted into a slot made on the medial side of the tibia, usually 1 or 2 cm. medially, and from 1 to 2 cm. distally from its normal insertion. Chromic catgut sutures through the periosteum and the fascia are used to hold the transplanted tubercle in place. If there are tight fascial bands on the lateral side of the patella, they are severed. In some cases the medial capsule is plicated if it is thought to be relaxed.

This operation accomplishes two things:

1. By bringing the patella to a more distal position, the patella gets effective support from the lateral condyle when the knee is in extension.

2. The direction of pull of the quadriceps muscle on the patella is changed so that the component of force tending to pull the patella laterally is eliminated.

In knees in which there is considerable inward curvature (knock knee), the outward pulling force may not be eliminated entirely by the transplant operation and supracondylar osteotomy also will be necessary. This was done in 9 knees.

There was no constancy in the findings reported at operation. An underdeveloped lateral femoral

condyle was noted in 4 cases. Usually, this structure is not exposed sufficiently during the transplant operation to determine whether aplasia is present. In 5 cases tight fascial bands or tight aponeuroses on the lateral side of the patella were reported. However, in 12 cases it was thought advisable to divide the lateral structures, although whether they were a deforming factor in all of them is not mentioned. In 3 cases, the quadriceps muscle was not in line with the patellar tendon and was therefore exerting an abnormal lateral pull on the patella. This is also more common than noted because a fair degree of knee valgus was present in one-third of the cases. In 1 bilateral case the patellae were found completely dislocated on the side of the lateral femoral condyles. They were held there by tight fascial bands and seemed to have developed in this position.

The synovial membrane of the knee joint was inspected in 2 cases, and it was found to be thick and congested, with villous hypertrophy. This is a significant finding since in many of these knees osteoarthritis will eventually develop unless the chronic irritating factor of a dislocating patella is corrected by operation.

After operation a long leg cast is applied and kept on for six weeks. At the end of this time the cast is removed and a roentgenogram is made to see whether the transplanted block of bone has firmly united in its bed. All of these patients showed firm union in six weeks. Massage and gentle motion are given, and in another week or two the patient is allowed up with crutches, and gradual weight-bearing is started. Motion and normal gait return rapidly, and for most patients normal activities are possible in three months.

End-results are classified as excellent, good, and poor. A patient with an excellent end-result has no patellar slipping, no recurrence of dislocation, no symptoms, and no restriction of activity. Anatomically, the patella is in normal position on flexion and extension. Roentgenograms show the absence of arthritic changes, with the patella in a more distal position and riding in the patellar groove.

A good result is one in which the patella does not dislocate, but there may be slight slipping on flexion or extension without symptoms. Roentgenograms may show slight arthritic lipping without clinical evidence of arthritis, and there may be slight lateral displacement of the patella.

A poor result is one in which the patella dislocates at the time the cast is removed and motion is started, or which does not dislocate for several months after the operation but subsequently does so.

There were 22 knees with a follow-up period of from one to seven years on which the tibial tubercle transplant operation was done. The average follow-up period for this group was three and five-tenths years. Eleven, or 50 per cent, of the knees showed an excellent result; 9, or 40 per cent, showed a good result, and 2 knees, or 10 per cent, showed a poor result. This makes 90 per cent satisfactory results from this type of operation.

The fascial and capsular structures on the lateral side of the patella were cut in 12 knees at the same time that the tibial tubercle was transplanted. Six of these showed excellent results, 4 good results, 1 poor results, and 1 had a retransplant.

The medial capsule was reefed or plicated in 8 knees at the time of the transplant operation. In 1 the result was excellent, in 6 it was good, and in 1, poor.

Nine supracondylar osteotomies were done in patients who had tibial tubercle transplants. In 2 of these 9 cases the results were excellent, in 5 they were good, and in 2, poor. On the other hand, there were 10 knees which had transplants without osteotomy; all of these showed excellent results. None of the cases which had transplants alone had an appreciable amount of valgus. In knees with severe knock-knee deformity (15 to 20 degrees) it is important to correct the valgus by supracondylar osteotomy before the transplant operation is done. In 3 patients, supracondylar osteotomy failed to stabilize the patella because of the recurrence of knock knee. Subsequent tibial tubercle transplants were not adequate to prevent dislocation until a revision of the osteotomy was done and the knock knee corrected. In the average genu valgum (5 to 10 degrees) the transplant operation can be done alone with the expectation that no further operation will be found necessary.

In 1 case in which the condition was bilateral, supracondylar osteotomy alone was done. Both knees showed a good result years later. There had been 10 degrees of valgus deformity before the operation.

Plication of the medial capsule alone was done in 2 knees. Six years later, 1 knee showed a good functional result, the patella subluxating slightly to 160 degrees extension. In the other case, a transplant of the tibial tubercle was required one and one-half years later because of the recurrence of dislocation.

The causation of chronic recurrent dislocation of the patella in adolescence is obscure but probably involves a combination of factors acting together on a certain age group, made up chiefly of the female sex. Various opinions from the literature are recorded concerning the etiology.

In many instances, chronic recurrent dislocation of the patella is not seriously disabling, but nevertheless it should be treated by operation to prevent the early onset of osteoarthritis.

Operative treatment by means of the tibial-tubercle-transplant operation is not technically difficult and is satisfactory. This should be combined with plication of the medial capsule and release of tight fascial bands laterally when it is found to be necessary.

In the more severe types of deformity, with considerable genu valgum, both supracondylar osteotomy and tibial tubercle transplant will have to be done. The complete correction of the valgus deformity should be emphasized.

ROBERT P. MONTGOMERY, M.D.

ORTHOPEDICS IN GENERAL

Bell, A. L. L., Edson, G. N., and Hornick, N.: Characteristic Bone and Joint Changes in Compressed-Air Workers. A Survey of Symptomless Cases. *Radiology*, 1942, 38: 698.

The most widely accepted theory of "bends," or caisson disease, is the gas-embolism theory which explains that upon release of external pressure the tissues give up their nitrogen to the outside air via the circulating blood. If the rate of nitrogen release is very rapid, gas bubbles may appear in the tissues, particularly fatty tissues which absorb five times as much nitrogen as other tissues yet do not have the copious blood supply to facilitate release of the gas via the pulmonary circulation. This holds true for the brain, spinal cord, marrow, and fat. Tissue rupture from escaping gas bubbles may occur which gives rise to "bends."

A great many cases of aseptic necrosis of bone have occurred in patients without previous symptoms or history of "bends." Since bone marrow contains a great amount of fat, especially in the femora, humeri, tibias, radii, and ulnas, and since

Fig. 1. Large area of calcification in the lower portion of the shaft of the femur almost completely filling the old necrotic area.

Fig. 2. Roentgenogram showing collapse and fragmentation of the articular surface of the upper extremity of the humerus.

the bony cortex is non-expansible, the gas accumulations produce more capillary obstruction here than in other tissues. This results in aseptic necrosis of the bone, most likely to occur in those bones containing the greatest amount of fatty marrow—namely, the femora and humeri.

In a study of 32 cases of compressed-air workers without skeletal symptoms, 24 revealed bone changes. The femora were involved in 21, the humeri in 17, the tibias in 5, and the fibula in 1. Those with a longer history of continuous employment showed greater changes, consisting of areas of necrosis in the medullary portion and also strands of calcification within and about the necrotic areas. In the heads of the bones, areas of increased density appeared adjacent to the articular margin with thinning, irregularity, and finally collapse of the joint surface.

The authors present a remarkable series of roentgen films illustrating the pathological changes described and conclude that the changes are due to frequent and inadequate decompressions which lead to the formation of cumulative nitrogen gas and consequent infarctions.

DANIEL H. LEVINTHAL, M.D.

Harris, R. I., and Coulthard, H. S.: The Prognosis in Bone and Joint Tuberculosis. An Analysis of the Results of Treatment and a Consideration of the Factors Which Influence the End-Result. *J. Bone Surg.*, 1942, 24: 382.

This article is essentially a one- to ten-year statistical follow-up of 296 patients, mainly adults, who were treated at the Weston Sanitarium, Canada. In most of the cases the diagnosis of bone and joint tuberculosis was confirmed bacteriologically. Treatment consisted of recumbency, general restorative measures, and surgical fusion of weightbearing joints whenever possible. In general the prognosis was influenced by the presence of other tuberculous foci and by the presence of a secondary, contaminating organism in abscesses and sinus tracts. Repeated aspiration of the abscesses was practiced to prevent spontaneous rupture and contamination. Bovine tuberculosis was not seen in recent years.

Secondary infection caused a poor prognosis in all cases, but especially in those with involvement of the spine and hip. The most serious complication was pulmonary infection (40 per cent), and the authors caution against treatment of the bone lesion without treatment of the pulmonary lesion. Thirty per cent of the patients had tuberculosis of more than one bone or joint and in these patients healing was prolonged. Genitourinary tuberculosis was present in more than 20 per cent of the cases.

It has been found that bony ankylosis offers the best prognosis regardless of the number of lesions, but it can be applied with safety only after the pulmonary lesion has been controlled.

The mortality rate for the 296 patients was 28 per cent. Miliary tuberculosis including meningitis accounted for 9 per cent, pulmonary tuberculosis accounted for 7 per cent, and chronic suppuration (secondary infection) accounted for 5 per cent. Addison's disease and renal tuberculosis were next in order. Nontuberculous deaths, including postoperative deaths, amounted to 4 per cent.

DANIEL H. LEVINTHAL, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Dale, D. U., and Jaques, L. B.: The Prevention of Experimental Thrombosis with Dicoumarin. *Canad. M. Ass. J.*, 1942, 46: 546.

The authors report that intravenous injection of 3,3-methylenebis (4-hydroxycoumarin), "dicoumarin," increases the prothrombin time of dogs. The administration of this substance in sufficient amounts prevents the formation of intravascular and extravascular thrombi. This demonstrates an intimate connection between the clotting mechanism and the formation of (agglutination of) platelets. Further, it provides an experimental basis for the clinical use of the material to prevent thrombosis.

Because of its cheapness, its long-continued action, and the fact that it is active on oral administration, dicoumarin possesses many definite advantages for clinical use in the prevention of thrombosis. The long latent period before its effect is demonstrable and the impossibility of terminating this effect quickly may constitute disadvantages. Before its clinical use can be recommended, further studies regarding its toxicity should be undertaken.

WALTER H. NADLER, M.D.

Homans, J.: Thrombosis as a Complication of Venography. *J. Am. M. Ass.*, 1942, 119: 136.

Since the procedure of venography may perhaps become widely used following its recent introduction in a number of larger clinics, the complications to which it may give rise should be a matter of general knowledge. With this objective in view, the author reports an instance of severe pain and local thrombosis resulting from the introduction of a 50 per cent compound diodrast solution into the lesser saphenous vein of the leg. Twenty cubic centimeters of this solution were injected over a period of twenty seconds, after which 20 cc. of salt solution were injected into the same cannula. Within a minute after the injection, the patient experienced a violent cramp in the lower part of the leg, which was so severe as to cause him to writhe. Later during that night, the patient experienced an aching discomfort in the right calf and was conscious of a tightening and swelling of the right leg. At morning it was clear that a fresh, extensive thrombosis had occurred in the deep vein of the leg. The calf had increased perhaps 2 cm. in circumference, the foot was bluish, and the muscles felt tense and resistant. Because of a history of recent pulmonary infarctions it was deemed advisable to divide the femoral vein at the groin. This operation was done with local anesthesia. The greater saphenous vein also was sectioned.

About two weeks after the operation the leg had resumed a normal appearance and the patient was then able to get out of bed wearing an elastic stocking. He gradually increased his periods of activity which brought on no swelling and no more than a moderate engorgement of the ankle and foot.

Twenty-seven days after venography an impacted third molar tooth was extracted. This was followed by another attack of thrombosis, this time in a branch of the lesser saphenous vein directly tributary to the vessel into which the injection of diodrast had been made. Upon elevation of the extremity in bed this whole process cleared up within five or six days, and the patient has since remained well.

The rare serious general reactions to the introduction of iodine solution are at present unpredictable. Death has been known to occur in the making of a venogram with diodrast. In the case presented here, there was no question of any constitutional reaction. The use of diodrast is a procedure so valuable that one unfortunate but not serious accident should not be held against it. A watch should be kept for similar episodes, with an eye to their prevention.

HERBERT F. THURSTON, M.D.

BLOOD; TRANSFUSION

Vaughan, J. M.: Pigment Metabolism after Blood Transfusion. *Brit. M. J.*, 1942, p. 548.

Whether a transfusion of stored blood is as efficacious as a transfusion of fresh blood is still a matter for discussion. It is probable that the relative value of the two fluids varies according to the type of case receiving the transfusion. It is the author's objective to determine whether the body is able to utilize the hemoglobin of fresh and stored blood to the same degree.

The author notes the effects of serum bilirubin and fecal urobilinogen following transfusions with fresh and stored blood. Transfused red cells appear to be broken down by the cells of the reticuloendothelial system rather than by an intravascular mechanism. Immediately after transfusion of stored red cells there is an increase in serum bilirubin which is transitory. This increase does not occur with fresh blood, and is presumably due to the destruction of a proportion of the older cells. Since no gross difference in pigment excretion was found with the use of either fresh or stored blood, the author concluded that the pigment which is rapidly liberated after transfusions with stored blood is to a large extent retained and used by the body, at least in normal individuals.

The fact that the level of serum bilirubin rises somewhat after the administration of stored blood but not after the administration of fresh blood suggests that at least some of the cells of stored blood are more readily broken down in the body than those of fresh blood. Since the increased pigment in circulation is bilirubin, methemalbumin not being found in demonstrable amounts, it seems probable that the breakdown is an intracellular one. The

author noted that the excretion of urobilinogen was unaffected to any appreciable extent by the age of the blood given or by the level of the serum bilirubin, and that though some of the red cells of stored blood are more rapidly broken down than the red cells of fresh blood, the pigment is retained and used by the body. HERBERT F. THURSTON, M.D.

Aubert, E. F., Boorman, K., Dodd, B., and Loutit, J. F.: The Universal Donor with High Titer Isoagglutinins. *Brit. M. J.*, 1942, 1: 659.

The use of Group O blood for recipients of other groups was first suggested by Ottenbert in 1911. He argued that the anti-A and anti-B isoagglutinins—theoretically incompatible for recipients whose cells possess the corresponding agglutinogens—would be so diluted by the recipient's plasma as to be rendered innocuous. In many places the use of Group O blood for recipients of all groups has become established, but whether this practice is always advisable is still a matter for speculation.

The authors point out that in 1923 Levine and Mabee issued a warning that Group O blood might be dangerous for other groups if its isoagglutinins were of high titer. This view has been stressed quite recently by some who regard a considerable proportion of Group O donors as potentially dangerous. On the other hand, a considerable body of opinion supports the belief that universal donor blood is safe for recipients of other groups. The general impression among workers in the transfusion services of this country is that danger from isoagglutinins is slight.

The remarkable disparity of views held about the "universal" donor has been due to lack of direct evidence. When a hemolytic reaction has followed the use of universal donor blood, the isoagglutinins cannot justifiably be blamed unless it can be shown: (1) that the transfused blood contained isoagglutinins capable at body temperature and in considerable dilution of clumping the cells of the recipient; and (2) that the recipient's and not the donor's cells were destroyed. Investigations carried on by the authors and reported herewith were made (1) to confirm the range of agglutinin titers found by other workers in Group O plasma; (2) to select blood from donors possessing high titer isoagglutinins for transfusion (thus satisfying criterion (1) above); (3) to use plasma or serum rather than whole blood and thus avoid the complicating factor of the donor's cells; (4) to control the transfusion of high-titer Group O plasma or serum with similar transfusions of low and moderate titer fluids. Recipients of Group A were selected, as this is a common group and as the anti-A titer in Group O plasma tends to be higher than the anti-B.

In assessing the results of these transfusions the following were observed in particular: the clinical reaction of the recipient; the effect on the recipient's erythrocytes; and the part played by the anti-agglutinin mechanisms in the recipient.

The technique of isoagglutinin titration, the preparation of serum and plasma for transfusion, and the manner of examination of the blood samples from recipients are described.

Titrations were made of 250 unselected Group O sera. Although several of the recipients developed symptoms possibly attributable to the action of these isoagglutinins, no reactions which caused more than a transient deterioration in the general condition were observed. Even in the patient who developed severe lumbar pain, hemoglobinemia, and hemoglobinuria, the symptoms subsided in a few minutes except for a mild headache. The hemoglobinuria persisted for six hours, but there was no evidence of any impairment of renal function.

The transfusion of conscious recipients of Group A in all 12 cases with considerable volumes of Group O serum or plasma containing extremely potent anti-A isoagglutinins did not produce any reaction which could be classed as dangerous. There was no evidence that "incompatible" isoagglutinins are responsible for severe or fatal hemoltyic reactions.

In all of these transfusions, however, there was some evidence of red-cell destruction in the recipient, with the production of symptoms in some cases. The authors conclude that Group O blood with an agglutinin titer of 512 and over is not recommended for recipients of other groups in nonemergency transfusions designed to raise the red-cell count, and that the agglutinogen present in the plasma of Group A recipients is not an absolute protection against anti-A agglutinins.

In general, therefore, when a transfusion is designed to raise the recipient's red-cell count, homologous group blood should be given if possible. On the other hand, in an emergency when restoration of the blood volume of the recipient is the chief aim, the use of the universal donor is justified. Plasma and serum are also given for this purpose. When pooled in suitable proportions, as is the practice in the emergency blood-transfusion services, the anti-A and anti-B titers rarely exceed 16, so that the isoagglutinin content is small enough for these pools to be given with confidence to recipients of any group.

HERBERT F. THURSTON, M.D.

Aagaard, G. N.: Transfusion Reactions and Erythroblastosis Fetalis Caused by the Rh Factor. *Minnesota Med.*, 1942, 25: 267.

In 1940, Landsteiner and Weiner first showed that 15 per cent of human beings lacked an agglutinogen, designated Rh (rhesus), factor and are designated as Rh negative. Reports indicate the Rh factor may be the cause of a large number of hemolytic transfusion reactions.

Weiner and Peters explain that the possible reason these reactions do not occur more often is that not all Rh negative persons are able to produce Rh agglutinins, or that subsequent transfusions of Rh positive blood are either not given or are not given at a time when a high titer of Rh agglutinins is present in the recipient.

Studies of erythroblastosis fetalis, which includes fetal hydrops, icterus gravis, and congenital anemia,

by Darrow, Levine, Stetson, Burnham, and others have suggested an antigen-antibody reaction between the infant's and mother's blood.

It was shown that most of the mothers of infants affected were Rh negative in contrast to the 15 per cent expected from the general population, and all of the affected infants and their fathers were Rh positive. It is likely that the Rh positive fetus stimulates the production of Rh agglutinins in the mother's blood which gain access to the fetus and cause lysis of the fetal red cells and in this way produce the disease.

Dienst, McQuarrie, and Ottenberg have supported the theory that toxemia of pregnancy may be on the basis of incompatibility of the maternal and fetal blood and the Rh factor may be the causal agent.

A method for testing for Rh agglutinins is described. A list of Rh negative blood donors should be available on every obstetrical service. The husband should not be considered as a donor.

Two cases of transfusion reactions in obstetrical patients in which the Rh factor appeared to be the cause are described in detail.

JOHN E. KIRKPATRICK, M.D.

Polayes, S. H., and Squillace, J. A.: Nearly Fatal Reaction to Transfusion. *J. Am. M. Ass.*, 1942, 118: 1050.

The authors discuss in detail the case of a nearly fatal reaction to transfusion with normal human plasma. The next day after being delivered of a normal healthy female child, the patient began to bleed. She was given ergot by hypodermic at once, followed by a uterine stimulant by mouth, which was given three times during the day. She was also given an intravenous injection of 1 liter of 10 per cent dextrose in saline solution while preparations were being made for a blood transfusion. A compatible blood donor was not immediately available and the patient was given 250 cc. of normal human plasma prepared by the rapidly lyophilized process and which had been kept available for such an emergency. The plasma was diluted and administered exactly as specified in the directions accompanying the outfit. No cross-matching tests were performed since the instructions on the circular specifically stated that such tests were entirely unnecessary. The injection of the plasma was slow. About twenty minutes after the completion of the transfusion the patient had a chill which was accompanied by nausea and vomiting. The pulse rate rose to 160 per minute. The poor condition and general appearance of the patient convinced the attending physician that death was impending. The patient also was in acute shock. This condition lasted about thirty minutes, then began to subside. The color gradually improved and the pulse rate dropped. The following day a whole blood transfusion was given to the patient without any untoward results. The donor's blood was found to be compatible with her blood on cross-matching. Following this, she made an uneventful recovery.

Although the exact cause for this reaction is not entirely clear, the evidence points strongly to an incompatibility between the patient's cells and the plasma solution injected. Upon cross-matching of the patient's blood and the normal human plasma, it was found by the laboratory that a most pronounced and immediate agglutination of the red blood cells occurred.

In this case a cross-matching test of the plasma with the patient's blood prior to the transfusion might have spared the patient a nearly fatal reaction. It should serve as a warning against similar instances in the near future.

HERBERT F. THURSTON, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Ivy, R. H.: Early and Late Treatment of the Face and Jaws as Applied to War Injuries. *South. Surgeon*, 1942, 11: 366.

The most efficient treatment of face and jaw casualties entails close co-operation of the officers of the Medical and Dental Corps. The general care of the patient and the problems of wound infection and tissue repair are within the province of the medical officer, while the special problems of fixation of jaw fragments and care of the mouth and teeth, to insure restoration of occlusion and jaw function, lie particularly within the field of the dental surgeon. It is agreed that a correlated plan of treatment, if carried out from the advanced zone to the installations in the rear, will greatly shorten the period of disability of patients with face and jaw injuries. Every officer and enlisted man of the medical department is supplied with equipment that is useful in rendering first-aid treatment for jaw injuries.

In the combat area, the following points demand special attention:

Arrest of hemorrhage. It may be possible to check hemorrhage temporarily by digital pressure over an artery proximal to the bleeding area. Hemorrhage that cannot be checked by pressure demands a search for the bleeding vessel and application of a clamp to it, followed by ligation.

Provision of adequate respiratory airway. Loss of bone and muscle attachment frequently results in loss of control of the tongue with danger to respiration. This danger is best opposed by use of a long suture through the tip of the tongue. In other cases, in which there is respiratory difficulty due to swelling of the soft tissues, sufficient airway can be provided by insertion of a rubber tube through the nose or mouth to the nasopharynx. Tracheotomy should be considered only as a last resort.

Temporary approximate reduction and fixation of bone fragments. Each advanced station is provided with an emergency kit which contains instruments and materials for emergency dental operations and for temporary fixation of fractures of the jaws. Early fixation should aim at the restoration of the original occlusion of the teeth, or the restoration of the function of mastication. Tooth fragments, foreign matter, and completely detached particles of bone should be removed. Fixation of the lower to the upper teeth should never be done prior to unattended travel. Stabilization of fragments at this stage of the treatment helps to reduce pain and shock, assists in the maintenance of a clear airway, and reduces the danger of recurrent hemorrhage.

Provision of dependent drainage. If a large gaping wound is present it is best not to try to close it, but exposed bone ends should be covered by suturing skin to oral mucous membrane. Officers are warned never to close a wound that communicates with the lower jaw or oral cavity without providing adequate dependent drainage.

It is desirable to emphasize, in connection with war wounds in general, the established value of the sulfonamide compounds both locally and by mouth.

Provision for safe transportation from combat zone to hospitals in the rear. One of the lessons learned in past wars was that ambulant or semiambulant patients with oral or pharyngeal wounds should sit up during evacuation. If the patients must be recumbent they should be placed face downward.

The surgical hospital, a mobile unit, is the most advanced organization having personnel especially trained in the care of face and jaw injuries. The maxillofacial team will consist of a surgeon and a dental surgeon. In this hospital more detailed examination of the wound, more permanent control of hemorrhage, more thorough débridement, and more stable fixation of fragments can be carried out.

At installations farther to the rear where more facilities are available, the initial consideration is to combat infection, if present, by means of local care with the aid of chemotherapy. The reduction and fixation of bone fragments must be checked and there must be repair of soft tissues by means of local closure, flaps, or grafts. Necessary bone grafting must not be done for at least three months after all infection has subsided.

Treatment of burns of the hands and face with tannic acid has given unfortunate results. An open method requiring the application of an aqueous emulsion of sulfadiazine or boric ointment, a covering of fine mesh gauze, and a pressure dressing is recommended as a first-aid measure for the hand; for the face, no dressing at all is recommended. Definitive treatment consists in cleansing the surface with soap and water, careful irrigation, and débridement of the blisters; then dressings similar to those described are applied. In third-degree burns, a light frosting of crystalline sulfanilamide should be applied at the time of redressing. As soon as the granulating surface is clean it should be skin-grafted.

BRADFORD CANNON, M.D.

Trueta, J.: Treatment of War Wounds and Fractures. *Brit. M. J.*, 1942, 1: 616.

A five-point program is outlined for the treatment of wounds sustained in modern warfare. These points are: (1) prompt surgical treatment; (2) cleansing of the wound; (3) excision of the wound; (4) provision for drainage; and (5) immobilization in a plaster-of-Paris cast. Prompt treatment depends on the organization of rescue and ambulance teams. In order to minimize the risk of shock, the choice of anesthetic for early operation should be given careful consideration. Cleansing of the wound is best achieved with soap and water, while the surrounding

skin is treated with a weak solution of iodine or a similar skin antiseptic.

The keystone of the whole technique is proper excision of the wound. Without proper excision no recent wound should be enclosed in plaster. The wound must be enlarged and incision and excision carried down layer by layer to the bottom of the wound. Only a narrow strip of skin should be excised; muscle and fascia should be excised radically; periosteum should not be incised, and bone should be removed only when it has lost its periosteal and muscle connections. In the management of bone, conservatism is indicated. Drainage with dry gauze of fine mesh is advised. The gauze is inserted into the intramuscular spaces without pressure, and if deep cavities remain, counterdrainage is provided with a rubber drain in the most dependent part. Drainage is promoted through the absorbent properties of plaster-of-Paris, which is applied directly to the skin except over bony prominences, and so molded to exert gentle pressure on the wound. It is emphasized that without proper excision the encasing of the wound in plaster is dangerous.

The difference between this five-point program and the Orr method is defined by the author. It is more than the difference between using dry and vaseline gauze. This mistaken impression may lead to serious consequences. Trueta believes that Orr's method of treatment is best for late cases and he does not advocate the use of his own method for these cases. Orr states that excision is of secondary importance, while Trueta believes it to be the most important factor in his five-point program. The latter's method is based upon a combination of the principles laid down by Friedrich and Orr, and is intended for use in the early, critical stage of injury. He concedes that Orr's method may be best in base hospitals where only those patients who have survived the most critical period are sent. He insists upon the carrying-out of the five points to the letter.

JOHN L. LINDQUIST, M.D.

Eskin, L.: Early Transportation of Surgical Patients, and Its Significance for the Organization of Surgical Aid to Patients with Abdominal Wounds. *Chirurgia*, 1941, 1: 45.

Eskin reports his experience with early transportation of surgical patients.

He states that many surgeons believe that after an operation, particularly after an abdominal operation, the patient should not be moved to another hospital for a period of from twelve to fourteen days.

To the author, however, this conception appears to be dangerous, particularly in wartime, because it may lead to the idea that patients should not be operated on unless the operation can be performed in a place where the patient may remain for two weeks following the operation.

On the basis of his personal experience the author concludes that it is better to perform a necessary operation as soon as possible and to transport the patient, after the operation, to a more suitable location. In this way dangers of hemorrhages and infection are being markedly diminished.

Eskin's experience is limited to kidney operations performed on civilians (pyelotomies, nephrotomies, nephrectomies, nephropyelotomies). Twenty-five patients were transferred immediately after the operation (while they were still under the effect of ether anesthesia) from the hospital where the operation was performed to others from 2 to 10 km. distant, and in none of these cases complications resulted.

GEORGE SIMMONS, M.D.

Somerset, J. B.: Fractures in the Field. *Austral. N. Zealand J. Surg.*, 1942, 11: 243.

This article is based on experiences in the first Libyan and the Syrian campaigns. The casualty clearing station, as a unit, is still substantially the same as it was in 1918. The fact that the war in the Middle East has been entirely a war of movement, has given rise to many new difficulties because of the comparative immobility of the unit, by modern standards, in relation to the general scheme of action. One of the main objects is to render the casualties fit for evacuation as early as possible. The nature of the terrain in both Libya and Syria was such that gas gangrene was a rarity. The land had not been greatly cultivated, as in Flanders, and the hot dry air rapidly desiccated any excreta, so that gas infections were only a minor problem. Actually none passed through the unit in Libya and only 5 in Syria. In neither campaign did any gas-gangrene infection develop subsequent to arrival of the patients at the casualty clearing station. Dehydration of the patients was often a prominent finding, because of the limited water rations, and the length of time between the occurrence of the wound and the finding of the wounded by the bearers.

TYPES OF FRACTURE

About 86 per cent of all wounds seen occurred in the limbs. Nearly all of the fractures seen were compound and due to gunshot wounds—rifle, machine-gun, high explosive, grenade, and mortar grenade wounds, besides those from aerial bombs and explosive cannon shell from airplanes. A through-and-through punctured wound is no indication that the damage to bone and soft tissues will be any less than the damage associated with a large lacerated wound. It is well known that the course of a bullet or other missile in the body is unpredictable, and this is particularly the case after it has impinged on bone. By far the most common fractures were below the knee and below the elbow. Fractures involving the bones of the hand and foot were common. Fractures of the femur and humerus were less common, and there were still fewer fractures of the pelvis and shoulder girdle. Besides the battle casualties, a large number of compound fractures of both bones of the leg, due to road accidents were seen; the patients were chiefly motor cyclists. Many of the fractures were complicated by the involvement of joints or nerves, a few by involvement of large vessels, and many by wounds.

CONDITION OF THE PATIENT ON ARRIVAL

As has already been pointed out, many of the patients were extremely exhausted, shocked, exsanguinated, and dehydrated on arrival, and in all cases the first consideration was to assess the degree of shock and to institute the appropriate treatment, even before disturbance of the dressings. The author was very impressed with the efficacy of the simple measures, which he thinks are apt to be forgotten or neglected in these days of intravenous therapy.

Relief of anxiety. For this purpose, if for no other reason, a casualty clearing station should be sited in as safe a place as feasible—if possible, beyond the sound of gunfire—and it should at least appear to be well protected against aerial bombardment or "strafing." From this point of view the presence of nurses was found to be of great assistance. The mere sight of them produced a beneficial effect on the morale of the patients. There was a general dread of amputation, so, whenever possible, the patients were reassured that there was no question of their losing a limb. A hot drink was given them by the receiving medical officer, and immediately after they were seen by the surgeon all of the patients received a hot meal, except those to be sent to the operating theater within the next three hours or so. A hot meal within ten minutes of arrival and a shave were things that made the reputation of the unit among the troops. For patients with compound fractures and minor grades of shock, when there had not been excessive hemorrhage, hot drinks, morphine, rest, warmth, and a cigarette were generally sufficient to produce a marked response in an hour or so, when operative treatment could be undertaken. In the more severe cases, in addition to these measures, blood transfusion and the intravenous administration of saline solution were used with excellent effect. It cannot be stressed too much that no patient should be submitted to operation until his general condition warrants it.

Treatment of the fracture. All patients had, of course, received treatment at the main dressing stations, such as the dressing of wounds and application of splints, and in Libya many of those more seriously injured had been dealt with surgically by the advanced surgical teams.

PROPHYLACTIC TREATMENT

In addition to the oral administration of sulfanilamide or sulfapyridine, sulfanilamide powder (crushed tablets) was applied to the wounds, which were then dressed with "vaseline" gauze. The sulfanilamide drugs are largely responsible for the good results obtained. When clinical infection was present, it could in some cases be traced to improper treatment, such as the plugging of wounds of entry and exit. In other cases, infection occurred in patients who had suffered from considerable blood loss, and this was one type of case in which blood transfusion was found to be of great value.

The practice in the casualty clearing station was as follows: With the patient under general anesthesia, the clothing was cut away if this had not already been done. The dressings were removed and the whole limb, or as much of it as possible, was scrubbed with a nailbrush and soap and water, and then shaved. The skin was then prepared with ethersoap, benzine, spirit, and iodine. Sterile towels and sheets were applied as usual, except that great economy of linen, consistent with safety, had to be practiced.

At operation the skin edges were excised (as little skin as possible being sacrificed) also the soiled and damaged subcutaneous tissues and the edges of the wound in the deep fascia. Then, with a fresh knife, the deep fascia was widely opened, clot was evacuated from the depths of the wound, and all damaged muscle was excised. At this stage the shell fragment or other missile was often found and removed. In some cases, especially of the thigh, it was impossible to remove all damaged muscle, but as much was removed as possible. If the metallic foreign body could not be found, or was fragmented into small pieces, no very extensive search was made for it, but every effort was made to ensure that no fragments of clothing or other foreign matter were left *in situ*. The wound was then thoroughly irrigated with normal saline solution. Powdered sufanilamide was applied to the wound, either by spraying it into the wound from an ordinary atomizer or else by introducing it into the depths of the wound with a Volkmann's spoon or spreading it into all the recesses of the wound with the tip of a gloved finger.

The wound was then filled with "vaseline," level with the skin surface, and "vaseline" gauze was applied flat over the whole wound with a massive dressing over this. Packing the wounds with "vaseline" gauze was avoided because plaster splints were used in many cases and because packing is open to abuses. The author has seen compound fractures of the humerus and femur put up in closed plasters when "vaseline" gauze had been packed into a through-and-through wound from end to end, passing even between the fractured bone ends! It is a heartbreaking job trying to disentangle gauze from jagged and spiculated bone ends in the depths of a wound. So packing was abandoned altogether and it was made quite clear on the field medical card that there was no packing in the wound. We found it much easier to get the "vaseline" to stay in the wound if sufficient liquid paraffin was added to give the mixture approximately the consistency of cold cream.

COMPLICATED FRACTURES

Involvement of joints, especially of the knee joint, was common. Hemarthroses from fractures of the femoral or tibial condyles, for example, were aspirated. When a main vessel had to be ligated, closed plasters were not used.

Reduction of fractures. Under the circumstances, reduction of fractures was regarded as the least important of the objectives to be attained. In the majority of cases it was possible to obtain good reduction and to maintain the position, but if it was not possible to reduce the fracture easily, the limb

was put up in the best position which could be obtained without waste of time or exhaustion of the patient, the reason being that the main problem was the safe and comfortable transport of the patient to the general hospital, and not the obtaining of perfect anatomical alignment. These remarks apply chiefly to fractures of the femur, because it was in these cases that the greatest difficulty was experienced.

GENERAL REMARKS ON OPERATIVE TREATMENT

One of the most difficult problems was to decide when to let the wound alone and make no attempt at débridement. As a broad generalization wounds of more than thirty-six hours' duration were not disturbed, except by such manipulations as were unavoidable in putting up the fracture.

Anesthesia. The routine anesthetic was ether given by the open method. As time went on gas and oxygen were used less and less. No single spinal anesthetic was given, nor was local anesthesia used.

Amputation. It was rarely necessary to resort to major amputations, though amputations of fingers and toes were relatively common. In the case of the leg, disarticulation through the knee was preferred to amputation through the lower third of the thigh, because of the small amount of muscle divided in this operation and the fact that secondary amputation was facilitated. Whenever possible, flaps were cut and turned back. Primary closure is a criminal procedure. The author saw 2 cases in which set amputations through the thigh with primary closure without drainage had been performed. Both these patients nearly died.

IMMOBILIZATION OF FRACTURES

Immobilization of fractures was of prime importance, and methods had to be devised to immobilize them under conditions of transport over extremely rough roads for very long distances.

Fractures of the upper limb. Fractures of the humerus presented very little difficulty. They were put up at first in the ordinary way with the arm bandaged to the side. Patients travelled more comfortably if a plaster slab was applied from the shoulder down the dorsal and lateral aspect of the arm and forearm, and another small slab was applied along the medial aspect of the arm, from axilla to elbow, the arm then being bandaged to the side with a few turns of plaster bandage. Fractures in the region of the elbow joint and below the elbow were put up either in closed plasters or by means of plaster slabs, and the arm was then put in a sling.

Fractures of the lower limb. Thomas splints were used with fixed extension applied in various ways. It was often difficult or impossible to obtain a correctly fitting Thomas splint for each individual patient. It must be realized that a very much greater degree of extension was necessary than in the case of a patient with a similar fracture lying in a hospital bed.

A clove hitch was applied over the boot. While perfectly satisfactory for short periods, this method was unsuitable for a much longer period. A pin passed through the boot and a spring clip that grasped the boot were much more satisfactory and appeared to be one of the best methods; but there was still a lot of pressure on the dorsum of the foot and the upper part of the heel, which gave the patient a good deal of pain after it had been on for any length of time. Strapping extension applied with a spreader or Sinclair's footpiece showed a decided tendency to slip, in which case the patient suffered badly. The methods of immobilization of the lower limb employed in the casualty clearing station were two: (1) Thomas splint with skeletal traction, and (2) some form of plaster splint.

COMPOUND FRACTURES OF THE TIBIA AND FIBULA

The routine was to put up compound fractures of the tibia and fibula (after débridement) in closed plasters. A limited stock of "Cellona" bandages were on hand. These were ideal because the plaster slabs could be made by an assistant, dried, and be ready for application by the surgeon as soon as the operative procedures were complete. Also, the plasters could be made lighter than with the plaster bandages prepared by the orderlies. The plasters were applied directly over the shaved skin except over the wound, where a massive dressing was first applied to soak up discharge from the wound. It was not the intention that these plasters should be left on for any length of time after the arrival of the patient at the general hospital. The usual routine was to apply a plaster back slab, and to complete the plaster in the ordinary way by means of plaster bandages. These plasters were kept as light as possible, consistent with safety, particularly over the site of the wound, the position of which was marked on the outside of the plaster. Particular care was taken to mold the plaster closely around the knee, which was slightly flexed in order to prevent rotatory movements of the leg. These patients travelled perfectly comfortably, unless they had to be kept in the casualty clearing station for several days, when the plaster became loose enough to allow considerable movement. When there was evidence of clinical infection, closed plasters were not used, nor were they used in the older wounds when débridement was not done, unless the wound looked healthy and the temperature was below 99° F. In those cases the Thomas splint with skeletal traction was used, and a footpiece was attached to the splint to keep the weight of blankets off the toes.

At first in Libya there were no Kirschner wires, and strapping extension was tried, which was found extremely unsatisfactory. Therefore the workers fell back on the use of Bohler's pins, which served their purpose perfectly well. Later they were fortunate enough to acquire a large number of stainless steel bicycle spokes which were easily converted into Kirschner wires. Still later an adequate supply of Kirschner wires became available, and from then on no other form of skeletal traction was used. In a few cases Kirschner wires and plaster were used together,

when it was necessary to maintain traction while the plaster was being applied. After the leg was put up in the Thomas splint with skeletal traction, the whole limb was bandaged around the Thomas splint from the ring of the splint down to and including the foot and footpiece. This was done to minimize rotatory movements of the limb. For the same reason, the stirrup of the Kirschner wire was tied to the side bars of the Thomas splint. The Thomas splint was always bent slightly and great care was taken to ensure that the angle of the ring was so adjusted that the pressure was taken on the ischial tuberosity.

COMPOUND FRACTURES OF THE FEMUR

Compound fractures of the femur presented by far the greatest difficulty, because the patients were often severely shocked on admission to the unit and because the fractures were very difficult to reduce and immobilize. The Thomas splint with skeletal traction was used as a routine. However, there was no delusion that the fractures of the femur put up in this way were immobilized. It was easy to fix the lower fragment, but impossible to control movements of the upper fragment during the jolting of travel over rough roads. From the results of those fractures sent down by Colonel Littlejohn from Tobruk, the plaster spica appears to be the method of choice.

It was possible to establish the fact that no single patient developed gas gangrene after arrival at the casualty clearing station or at any later date.

ROBERT P. MONTGOMERY, M.D.

Phillips, L.: Some Practical Points in the Reception and Treatment of Air-Raid Casualties. *Med. J. Australia*, 1942, 1: 395.

The author covers certain practical points regarding the reception and treatment of air-raid casualties which, although of somewhat minor character, have not been sufficiently emphasized.

In regard to the differentiation between bomb explosions and gunfire, the author points out that anti-aircraft gunfire has a sharp report, whereas bomb explosions have a muffled sound and produce a "minor earthquake" in the vicinity. Most of the noise during an air raid arises from ground defensive fire.

Air-raid casualties are shockingly covered with dirt and grime, and the effect of a mixture of this dirt with blood is ghastly. Consequently, in the reception room of casualty hospitals there should be adequate personnel and equipment to gently, quickly, and thoroughly wash all wounds without permitting the patient to become cold.

Several types of common wounds are discussed. Frequently, patients wounded in the open will be pitted with numerous small puncture wounds. In certain individuals, these puncture wounds are shallow and the gravel or asphalt causing them can be removed by light scrubbing with a brush. In other patients the penetration is deeper, but the foreign body can be felt with a probe. These foreign bodies must be removed by excision. Similar wounds in which the foreign body is neither visible nor palpable must be thoroughly explored, particularly if they overlie the peritoneum. Wounds from splintered glass are very common, and their treatment depends upon the extent of injury. There is considerable danger from burns and scalds resulting from bursting hot-water pipes in basements during air raids. Such burns should be cleansed thoroughly and rapidly, and the areas tanned by some accepted method.

In the reception and classification of casualties, it is of utmost importance to have a senior man in charge. His duties include:

1. The examination of every inch of every casualty.

2. The disposition of the casualty—whether to the wards, to the x-ray department, or to the operating room.

3. The institution of antishock therapy and the administration of preoperative medication.

Antishock treatment is best carried out by a trained team, the training in intravenous therapy with shock-combating fluids having been obtained before raids actually occur.

Adequate emergency lighting is necessary for the proper care of casualties.

Finally, the author discusses briefly injuries incident to blackouts. He believes that blackouts are essential. The painting of the Red Cross on hospitals is regarded by the author as a device of dubious safety value.

LUTHER H. WOLFF, M.D.

Morrison, E. F. S.: Jottings on the Medical Administration of an Armored Division During Active Service. *J. Roy. Army M. Corps*, 1942, 78: 220.

Morrison states that units for operation in the desert must be designed for the most difficult operation they may be required to undertake, rather than reliance on the easy, the normal, and the simple. The distance from the starting point to the extreme limit of operations in the division having been nearly 2,000 miles, a broad outlook had always to be taken. In such a big zone it is self-evident that successful administration depends on sufficient transport. There is practically no obstacle to the passage of any number of vehicles. In a theater of war in which movement is restricted by the terrain, the larger the number of vehicles, the more difficult the movement becomes, and the size of the force employed must be limited to the communications available. A unit in the desert without wireless communications for all administrative units is uncontrollable.

The tracks followed were those made by track makers. Petrol tins and cairns were used as markers until a track was made. Unless tracks are marked there is absolutely no feature to go by.

In this division light field ambulances equipped with wireless were used and were found to be highly satisfactory. Such an ambulance unit must be trained to a high pitch if it is to function in the desert. For one thing it must be absolutely self-

supporting. It must be capable of moving, feeding, and sheltering itself and perhaps 100 patients—and that in a half hour—with the establishment of a main dressing station or advanced dressing station many miles away. It must be capable of producing a good meal in fifteen minutes. The light field ambulance personnel must possess a certain amount of desert knowledge, and drivers should all be able to read a map and take bearings. A slight knowledge of the stars is a great help at all times.

Desert worthiness means that the car has to be running well, that the driver is fit, and that the personnel is also fit. The vehicle must have (1) low pressure tires, (2) sand tracks, (3) sand mats, and (4) a radiator condenser. Essential vehicle equipment should include (1) a compass, (2) a scale map, (3) protractor, ruler, and pencils, (4) a torch, and (5) three days' vehicle rations and at least 12 gallons of water. Spare gas and oil are a matter of course. As regards personal equipment, a bedroll is worth having, as one may have to spend a night in the desert. When navigating complete trust must be placed in the compass and speedometer which have been previously checked.

Protection from air attacks is the prime consideration, and this is obtained in three ways: (1) by choosing the site of operations from a "camouflage" point of view, using the nature of the ground to help, i.e., a patch of scrub as opposed to bare desert; (2) by dispersing the vehicles so that there are at least 200 yards between each—the dispersion at least produces exercise; and (3) by digging slit trenches (4 ft. deep, 20 in. across, and each arm about 6 ft. long) as soon as the site is chosen. Slit trenches reduced the effectiveness of bombing more than anything else. Great care must be taken as regards track making. Nothing gives away positions more than tracks. Great care must also be taken in choosing a site from the wind point of view. A camp situated downwind of a dusty track will be very uncomfortable.

The evacuation of casualties may or may not be a problem; this will depend on the nature of the ground to be covered. Distances will be long and time will be great in getting patients to casualty clearing stations. Valuable work is done by staging sections. Patients are very apt to become uncomfortable during long journeys over bad going. A little sustenance and adjustment of bandages make a great deal of difference.

Mobility is one of the absolute and most important essentials of a field medical unit.

Life in a field ambulance can be both dull and exciting when operating in the desert. When the division is fairly static and there is not much doing in the way of fighting, then all that come through are the normal sick, and if a unit is acclimatized to a desert, the sick rate will be extraordinarily small. Then time hangs heavily, especially for the advanced dressing stations, which may be anywhere up to 30 miles from their nearest neighbor. With the policy of changing an isolated section once a month there is less time for loneliness and dreariness.

Prevalent diseases included:

1. Inflammation of the skin and areolar tissue, found in most troops operating under desert conditions with limited chances of washing themselves or their clothing. The broken skin may become secondarily infected. Return to normal hygienic conditions results in an immediate cure. One thing is definite—lack of vitamins is not the cause.
2. Gastroenteritis. This is usually of a mild type and responds to accepted treatments.
3. Catarrhal jaundice. EDWIN J. PULASKI, M.D.

Chelimski, M. A.: Surgical Work in a Casualty Station During the Finnish War in 1939 and 1940. *Chirurgia*, 1941, No. 2, 29.

In this report the author describes the work and the conditions under which it is done in a Russian casualty station located near Lake Ladoga, apparently not far behind the front. This was not a first-aid station, but a field hospital, to which patients were referred, some directly from the battlefield but most of them from a first-aid post. The work was carried on by 8 physicians at an outside temperature ranging from -12° to -30° C. These low temperatures made work extremely difficult, and the more so as it was impossible to maintain favorable temperatures inside of the hospital because of the continuous arrivals of new transports.

The task of this unit was to administer medical aid, to care for further evacuation, and to determine the order of evacuation of the single casualties.

Two points in the handling of the casualties by the first-aid station are being criticized by the author:

1. The tags carried by the patients sometimes were missing or incomplete, and often different forms had been used by the different regiments. This often caused loss of valuable time and information.
2. Tampons put into wounds often were not adequate, in as far as they had been pressed too hard into the wound. This had caused local irritation, pain, and elevation of temperature. These tampons had to be removed, and in such a way waste of material and time resulted. In addition, during the removal of the tampons the wounds started bleeding anew.

The casualty station was divided into two parts: in one part, the patient was admitted and disinfected and in the second part, the dressings were done. Food was given to the patients immediately after their arrival and before any surgical procedure was undertaken.

In every transport of patients there were shock cases. Sometimes shock occurred during the removal or change of dressings. The following observation is interesting: Shock did not occur so much and not only during the rapid transportation of casualties with immobilized fractures, but it occurred particularly in those cases in which extensive lesions of the soft parts were found, in which no immobilization of fractured bones had been attempted, or in which no morphine had been given before or during transportation.

The author, in co-operation with physicians from the first-aid post and hospitals farther behind the lines, gives statistics of the casualties observed and divides the casualties according to the nature of the injury and the site of the lesion. The sites of the injuries as observed were as follows:

	First-aid station Per cent	Chelimski's hospital Per cent	Hospitals Behind the Lines Per cent	Per cent
Skull	15.3	7.04	7.9	6.8
Neck	1.2	1.94	2.0	1.2
Chest	7.5	4.5	9.4	4.8
Abdomen	0.8	0.82	2.0	0.7
Spine	0.7	0.26	1.1	0.1
Upper extremity	39.8	47.1	31.0	38.7
Lower extremity	27.7	30.7	37.0	21.0
Soft parts	7.0	7.64	9.6	26.7
	100.0	100.00	100.0	100.0

As far as the nature of the injuries is concerned the following statistics are offered:

	First-aid station Per cent	Chelimski's hospital Per cent	Hospitals Behind the Lines Per cent	Per cent
Injuries due to firearms	....	80.0	85.0	....
Injuries due to mines	....	20.0	15.0	....
Combined injuries	....	21.6	23.5	17.0
Fractures due to firearms	23.7	14.5	28.1	19.0
Wounds of articulations due to firearms	2.8	...	11.1	3.7

As noted, in 21.6 per cent of all cases observed the patients presented multiple injuries, which sometimes had been caused by different agents (mines, bullets, shells). The extraction of mine fragments presented particular difficulties because of the bad quality of steel used by the Finns. Often it was impossible to remove these fragments by means of a magnet. For anesthesia, ethyl chloride was used, locally and generally, and no complications were encountered.

Transfusions were given often and in large amounts (from 500 to 800 cc.). The blood used had been supplied in ampouls by the Institute for Blood Transfusions in Leningrad.

The author reports a few unusual cases:

CASE 1: A bullet had penetrated at the external end of the right clavicle and was found in the soft tissues of the left lumbar region at the level of L4.

CASE 2: A bullet had penetrated 4 fingers below the acromion on the right and was found in the midscapular line, on the right, at the level of the ninth rib.

The medication used for cleaning of the wounds was rivanol, hypertonic salt solution, Vischnievsky's ointment, iodine, and brilliant green.

The fact is stressed that among the casualties observed only 7.04 per cent presented injuries to the skull, and these cases were usually light ones, except when the eyes had been injured. This shows the considerable protection offered by steel helmets. Injuries to the skull most frequently were caused by artillery shells and only light cases were transported.

CASE 3: A soldier was observed nine days after injury had occurred. Both frontal bones were destroyed. The nose and both eyes were also destroyed. The frontal bones were protruding and injured. No focal symptoms were found; consciousness was never lost; speech was not disturbed; and no vomiting had occurred.

CASE 4: A soldier was seen eleven days after injury. The left frontal bone and part of the left temporal bone were destroyed. There were no focal symptoms. Vomiting had occurred only on two occasions. The patient had been unconscious for only one hour.

Facial wounds represented 2 per cent of the casualties observed. These injuries, in the experience of Chelimski, usually healed quickly and without complications and were, therefore, let alone in the majority of the cases. Patients with injuries to the eye or orbit, or with fractures of the jaw, on the other hand, were evacuated by airplane to other base hospitals.

One and two-tenths per cent of all casualties observed were injuries to the neck, and usually were not very serious.

Almost all chest injuries were due to gun bullets and were complicated by hemothorax. In several cases a closed pneumothorax had become an open one after transportation of the patient from the field to the hospital. Of all casualties treated, chest wounds represented 4.5 per cent, and 1.3 per cent were due to penetrating wounds.

All cases with abdominal injuries referred to the author's hospital had had laparotomy or other surgical treatment before they were evacuated from the first-aid post. These cases represented only 0.82 per cent of the material studied. Injuries to the extremities were divided in the following manner:

Upper extremity:	Lower extremity:
hand: 42.4 per cent	foot: 38.9 per cent
arm: 35.6 per cent	leg: 38.0 per cent
shoulder: 22.0 per cent	hip: 23.1 per cent

Thomas splints were used routinely, but the results obtained in fractures of the upper third of the thigh were not satisfactory, and therefore definite treatment was delayed. In view of the difficulties encountered in the immobilization and treatment of fractures of the upper third of the thigh and of the shoulder there was a tendency during the Russo-Finnish war to establish special orthopedic hospitals near to the front, where these cases could be taken care of promptly and efficiently.

Injuries to the articulations were encountered frequently and in 25.8 per cent of such lesions the shoulder was involved. Next in frequency there were injuries to the knee joint (18.6 per cent) and the elbow joint (11.4 per cent). In these cases anaerobe infections frequently set in, and the frequency of these infections was greater in injuries caused by shrapnel than in those caused by bullets. These

cases were retained in the author's hospital and were not evacuated.

Injuries of the pelvis represented 0.28 per cent of the cases.

Treatment of anaerobic infections was undertaken prophylactically only very seldom because of the author's fear of anaphylactic reactions. In view of the shortage of help the Besredka method of desensitization could not be applied. Once an anaerobic infection had set in it was treated with wide opening, drainage, aeration, blood transfusions, and symptomatic remedies. Injuries to the external genitalia were seldom observed (0.2 per cent), but their treatment was very difficult in view of the frequent occurrence of infection and maceration and the difficulty to apply a suitable dressing. The author reports the best results with the use of brilliant green, which was used in order to dry the lesion. Following an application of this dye a sterile dry dressing was applied and the patient was evacuated as soon as possible. GEORGE SIMMONS, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Juers, E. H., and Peterson, H. O.: A Simple Method for the Removal of Iodized Oil from the Spinal Subarachnoid Space. *Minnesota M.*, 1942, 25: 270.

Dandy in 1919 introduced air myelography and Sicard and Forestier in 1922 first used lipiodol as an adjunct in the diagnosis of spinal-cord lesions. Different procedures have been developed with various gases with less accurate results than those using iodized oil. However, the removal of iodized oil from the subarachnoid space has proved technically difficult and the continued presence of this oil has been harmful in some instances.

Different methods have been described by Lucherini, Briesen, and Adson for the removal of lipiodol from the dural sac. These are not simple, however, and not suitable for routine use.

In 1941 Kubik and Hampton described an effectual procedure in which the oil was successfully removed by simply aspirating it through a spinal puncture needle immediately upon completion of the roentgenological examination.

Subsequently, the authors carried out this procedure on an additional 30 cases at the Interstate Clinic and University of Minnesota Hospitals, using the following technique of Kubik and Hampton:

The patient is placed face down on a tilt-type fluoroscopic table. An 18 gauge spinal puncture needle is introduced under aseptic conditions with an additional flap drape to protect it during fluoroscopy. The position of the needle must be checked fluoroscopically to make certain it is in the exact center of the spinal canal. Then 4 cc. of spinal fluid is withdrawn and 4 cc. of lipiodol is injected. The needle is left in place, protected by the sterile drapes, until all roentgenographic procedures are completed. Then the same 5 cc. syringe used for injecting the oil is attached to the needle and by extremely *gentle* traction on the plunger the oil is aspirated until spinal fluid appears. The needle is again covered with the sterile flap. The amount and location of the remaining oil is checked fluoroscopically and the position of the patient is changed, by tilting the table, in order to collect the oil about the tip of the needle. Aspiration is repeated until clear spinal fluid appears. Fluoroscopy and aspiration are repeated until all the oil has been evacuated.

This method has been successful in 13 of 17 cases. The technique must be followed in detail, particular attention being given to using very *gentle* suction with a small syringe in order to prevent sucking a nerve root or sac structure into the end of the needle.

JOHN E. KIRKPATRICK, M.D.

Blain, A. W., and Campbell, K. N.: The Hemostatic Effect of Oxalic Acid. Clinical and Experimental Results, with a Review of the Literature. *Arch. Surg.*, 1942, 44: 1117.

Despite normal coagulation and careful hemostasis, sufficient blood may be lost from capillary oozing in major operations to produce such complications as serum collections, wound infection, and wound disruption. The authors believe that an important advancement in operative surgery would be accomplished if a drug which would hasten coagulation could be administered to the patient. They present a report of their experiments with pure solutions of oxalic acid.

A number of workers who have used oxalic acid have found that it is antagonistic to antithrombin and hastens coagulation *in vivo*. This seems paradoxical, since the oxalates are well known as anticoagulants *in vitro*.

With regard to the toxicity of oxalic acid, the authors used a solution of recrystallized oxalic acid with a pH of from 3.5 to 4.8 given intravenously. Their experiments have shown that with a maximum dose of 140 mgm. to a single rabbit, no histological changes were produced in the kidneys, liver, spleen, pancreas, muscles, or gastrointestinal tract over a period of three days.

The optional dose for human beings was found to be between 20 and 40 mgm. The solution can be administered either intravenously or intramuscularly, and the dosage may be repeated within a short time.

Oxalic acid was administered to 440 operative patients upon whom a wide variety of surgical procedures were performed. There were no deleterious effects, and in every case oozing was controlled, good clot formation was obtained, and the operative field was made much drier. Secondary hemorrhage was believed to have been prevented.

Care must be used in the preparation of the solution. A saturated solution is first prepared by dissolving chemically pure oxalic acid in sterile distilled water at 60° C. This solution is cooled in a refrigerator to 5° C., and the precipitated oxalic acid is filtered. Then 10 gr. of dried recrystallized oxalic

acid are dissolved in 800 cc. of sterile distilled water, 140 cc. or normal sodium hydroxide are added, and sufficient distilled water is added to bring the volume to 1 liter. The pH of this solution then varies between 3.5 and 4.3. The solution is next filtered through a Berkefeld filter and the finished product is placed in sterile amber ampoules which are stored in a refrigerator. One cubic centimeter of the finished product contains 10 mgm. of oxalic acid.

The following observations were made in the 440 operative patients:

1. Either immediate cessation of the hemorrhage or a noticeable decrease in oozing occurred in practically all of the cases.
2. There was a definite measurable reduction in the coagulation time.
3. There was no appreciable decrease in the prothrombin time.
4. The best clinical results were obtained in most of the cases in which a large oozing surface constituted the source of hemorrhage.
5. There was no clinically demonstrable renal damage following the administration of oxalic acid.
6. In no case did thrombophlebitis develop after the use of this drug, nor were there any untoward clinical reactions.
7. There was an apparent decrease in the amount of serum collection in the incisional wound.
8. The administration of oxalic acid effectively controlled bleeding associated with carcinoma.

The authors conclude that oxalic acid is a safe, reliable, inexpensive, and almost instantly effective hemostatic agent. ROBERT D. MANSFIELD, M.D.

Sparkman, R. S., and Williams, W. H.: The Employment of Cotton Suture Material in the Field. *Surgery*, 1942, 11: 698.

During the maneuvers of the United States Army in North and South Carolina in the fall of 1941, the First Evacuation Hospital was encamped on a sandy field near Rockingham, North Carolina. A large tent was utilized for the housing of all facilities for the performance of major surgical procedures. Patients requiring emergency surgery arrived at the hospital in soiled field clothing after having passed rapidly through clearing stations and other forward echelons. The greater part of the preparation and sterilization of operating-room supplies was performed by enlisted personnel, who also acted in the capacities of scrub nurses and circulating nurses. The problems of dust and insect control were considerable. The sides of the operating tent were screened; insecticidal solutions were sprayed throughout the tent at frequent intervals; cardboard compartments were erected within the tent to enclose the operating area. Although these measures were helpful, they did not afford a complete solution to the problem of insect and dust control.

During the period of encampment, 124 appendectomies were performed. Cotton was employed as the only suture material in every case, with this exception: that fine plain catgut was used for ligation of the appendical stump in most instances in which the stump was inverted. The McBurney incision was used exclusively. There was no mortality in the group. Cotton was of the ordinary nonmercerized variety, either black or white. It was sterilized by boiling for twenty minutes or by autoclaving for fifteen minutes at 15 lb. of pressure, after having been wrapped on spools made of 4 cm. segments of soft rubber tubing. Size No. 80 cotton, usually black, was used for skin closure, while No. 100 white cotton was used for the ligation of blood vessels immediately beneath the skin. Either No. 50 or No. 80 cotton was employed in closure of the remaining layers of the McBurney wound, the choice depending upon the individual preference of the operator. Exclusive of the peritoneum, which was always closed with a continuous suture, interrupted sutures were used throughout. Ligation of the mesoappendix was accomplished with No. 50, No. 20, or No. 8 cotton, the larger sizes ordinarily having been employed when the operator desired to ligate the main bulk of the mesoappendix *en masse*. In 20 instances the appendical stump was not inverted, either because the operator preferred noninversion or because the extension of inflammatory reaction to the cecum contraindicated such a procedure. Inversion in the remaining 104 cases was accomplished with No. 50 or No. 80 cotton.

Prolonged scrubbing of the abdominal wall with soap and water was adopted as a routine preoperative measure. In cases exhibiting perforation or gangrene of the appendix, as well as in some additional cases in which the degree of suppuration was extensive, sulfathiazole or sulfanilamide powder in 8 gm. quantities was implanted in the peritoneal cavity, but on no occasion was either drug placed in the wound itself. In every case the wound was subjected to copious irrigation with physiological saline solution following the closure of each layer.

Of 124 specimens removed, 79 showed histopathological evidence of acute suppuration and 27 of these showed gross evidence of gangrene at the time of removal. There were 2 instances of perforation. In 2 additional cases gross contamination occurred as the result of disruption in continuity of the wall of a gangrenous appendix during the course of its removal. In each of these 4 cases a narrow strip of soft rubber dam was placed down to the peritoneum, which was closed. Drains in each instance were removed on the fourth or fifth postoperative day, whereupon each of the wounds in question healed by first intention.

In the remaining 120 cases both the peritoneal cavity and the wound were closed without drainage. Conclusions regarding wound healing in this group are generally based upon a period of postoperative observation of eight days, inasmuch as uncomplicated cases were evacuated to Station Hospitals after a lapse of that number of days. Subsequent written communications were received in 66 instances. In the group of 120 cases there were only 4 patients in whom wound complication was observed.

In 3 of these a small collection of uninfected serous fluid was evacuated from the wound on one occasion only for each case; no further fluid collected. It is believed that these cases cannot be regarded as instances of wound infection. The 1 remaining patient developed a left femoral thrombophlebitis on his sixth postoperative day, and suffered disruption of his wound on the thirteenth postoperative day. Following the evacuation of a large quantity of purulent material, the wound healed by granulation. The incidence of wound infection, assuming this to be the only instance which can be so regarded, was 0.83 per cent in the series of 120 cases, and the incidence of wound complication of any sort, regardless of nature or degree, was 3.33 per cent. In 1 patient sudden evidence of generalized peritonitis developed on the fifth postoperative day, in consequence of which the abdomen was reopened at the site of the previous wound. It was apparent that an abscess had formed about the appendical stump (which had not been inverted) with subsequent rupture of the abscess into the general peritoneal cavity. The peritoneum, however, was sealed, and the appearance of the wound at the time of re-entry was clearly that of primary healing. Convalescence and wound healing were uneventful following drainage of the abscess. No attempt was made to remove the cotton sutures placed at the first operation.

Because of fear of an increased incidence of postoperative pulmonary complications arising because of the accommodations, the general policy of allowing patients to be out of bed on the second or third day following operation was adopted. No ill effects of any sort were observed therefrom.

The experiences with cotton suture material are in entire support of the contentions of Meade and Ochsner that cotton may be employed safely in clean, contaminated, or infected wounds. There was no evidence to indicate that cotton acts as a detriment to wound healing in any way. Cotton possesses the advantages of being inexpensive, plentiful, easy to carry, and easy to sterilize.

MANUEL E. LICHTENSTEIN, M.D.

Schmitz, H. E., and Beaton, J. H.: Wound Disruption and Its Management. *Am. J. Obst.*, 1942, 43: 806.

The high mortality which attends the disruption of abdominal wounds makes this postoperative complication vitally important. From 1933 to 1940, there were never more than 1 or 2 eviscerations in 1,300 laparotomies a year, so that very little attention was directed to this infrequent complication. However, when 6 cases occurred in 1940 with a mortality of 50 per cent, an investigation and an analytical study were made. Considerable interest was aroused when it was found that 3 deaths from peritonitis occurred in patients who had been in good condition at the time of evisceration, and in whom repair had been done layer-by-layer. The 2 patients in whom repair was effected by simple through-and-through suture of all layers lived.

A review of the 10,725 laparotomies done on the gynecological service during the past eight and one-half years revealed 16 eviscerations or total abdominal wound disruptions. Noteworthy are the 11 deaths in these 16 cases, a high mortality of 68.7 per cent, while the average mortality reported was 34.8 per cent. The day of disruption varied from the second postoperative day to the twelfth, the average day of disruption being the seventh.

The most common factors associated with these 16 cases of disruption were: cough, 9 cases; emesis, 9 cases; distention, 8 cases; no tension sutures, 6 cases; infected wounds, 8 cases; drain, 2 cases; and obese wall, 2 cases.

The type of secondary closure used in these 16 cases was as follows: layer-by-layer, 7; simple through-and-through suture including all layers, 7; tampon and adhesive bridges, 1; 1 patient died before any treatment could be instituted. In the 7 cases closed layer-by-layer, there were 6 deaths, all from peritonitis. In the 7 cases closed by simple through-and-through suture, there were only 3 deaths, 1 due to peritonitis (pelvic abscess was present at time of repair), 1 due to bronchopneumonia, and 1 due to a pulmonary embolus. The only patient treated with tampon and bridges died on the day of evisceration because of cardiac failure.

When evisceration occurs, the first consideration is whether or not the patient's condition will withstand a secondary closure. If a generalized peritonitis, pelvic abscess, severe cardiac pathology, or pneumonia is present, the patient is best treated with a sterile gauze tampon and firm adhesive strapping. Several days later a satisfactory closure may be done.

If secondary closure is to be done at the time of evisceration, the patient is given ¼ gr. of morphine, strapped with adhesive, advised against coughing or straining, and taken to the operating room. Intravenous or spinal anesthesia is preferred.

A nonabsorbable type of suture is used, which may be a No. 12 braided silk, silver wire, or silkworm gut. No attempt is made to separate and identify the layers of the abdominal wall as this would mean considerable manipulation of an infected area. With a large cutting needle on each end, the suture is brought through the entire wall from within the peritoneal cavity to the skin surface, 2 in. from the edges. These sutures are not tied, but are held taut until all have been placed (1½ in. apart). As the operator draws these through-and-through sutures up for tying, the assistant keeps his hand inside of the peritoneal cavity for two reasons: (1) to make sure that the peritoneum is closely approximated, and (2) to prevent a loop of bowel from being caught in the closure.

Much has been written about the importance of Vitamin C in wound healing. On this basis one would expect many wounds on the authors' service not to heal. Their patients are nearly all poor negroes and whites, most often in a state of avitaminosis; also, they do not receive cevitamic acid routinely before or after operation. EDWARD L. CORNELL, M.D.

Brunschwig, A., Clark, D. E., and Corbin, N.: Postoperative Nitrogen Loss and Studies on Parenteral Nitrogen Nutrition by Means of Casein Digest. *Ann. Surg.*, 1942, 115: 1091.

Nitrogen-balance studies in 41 patients subjected to a variety of major surgical procedures revealed a net loss of nitrogen for the first ten-day period which varied widely from 3.81 gm. to 175.79 gm. in 36 patients. The loss was sustained for the most part during the first five days. In 5 instances, there was a slight net gain of nitrogen during the postoperative period which was due to an early return to a full diet.

The most important factor in the nitrogen loss is the restricted ingestion of food combined with the general physiological disturbances accompanying a major surgical procedure. With the nitrogen balance as a criterion, casein digest administered intravenously, in proper proportion with glucose, is effective in reducing or even preventing the postoperative net loss of nitrogen and thus it spares the organism from the effects of excessive protein catabolism. Casein digest with glucose may be employed intravenously as the sole source of nutrition, as it affords at least minimal caloric requirements under certain conditions, and includes an adequate supply of amino-acids to maintain the nitrogen equilibrium, or it may even afford a positive nitrogen balance in patients with depleted protein stores.

Whether or not a surgical procedure is performed or contemplated, the intravenous administration of casein digest is a means of forcing nitrogenous nutrition.

J. M. Mora, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Necheles, H., and Olson, W. H.: Experimental Investigation of Gastrointestinal Secretions and Motility Following Burns and Their Relation to Ulcer. *Surgery*, 1942, 11: 751.

Although gastrointestinal ulcers following burns are not frequent, there is no doubt that their incidence has been higher than that of a normal population. Many theories concerning the cause of Curling's ulcer have evolved during the last one hundred years, but no systematic work on gastrointestinal secretions and motility following burns has been found.

A number of authors have held toxic substances to be responsible for the development of Curling's ulcer. These substances have been believed to be the product of the burn in the affected area, and have been supposed to damage the gastric and duodenal mucosa either directly from the blood, or indirectly from the bile following their excretion in the liver, or still more indirectly by diminution of the bile secretion through the toxic effects of such substances on the liver.

The effects of burns on gastrointestinal secretion and motility were studied in anesthetized dogs. Salivary, biliary, and pancreatic secretions were diminished, with an exception in 1 experiment in which a considerable increase of salivary secretion was observed. Gastric secretion and acidity increased in a number of experiments following a burn. In 1 of the animals a prepyloric ulcer was found. An increased volume of gastric secretion seemed to depend on infusions, and an increase in acidity seemed to be related to infusions and previous feeding of the animals. In the experiments without intravenous infusion, no appreciable increase in volume of gastric juice was found after a burn. Feeding ten hours before the experiment seemed to result in a larger volume of secretion and a higher incidence of free acidity following a burn than the volume and incidence after a burn in an animal without food for thirty hours before the experiment.

These findings may have some bearing on conditions in the human patient suffering from burns because, except during the early morning hours, the human being is in the absorptive phase of digestion, and because the human being with burns usually receives large amounts of fluid by mouth or by clysis.

Evidence is accumulating that histamine or a related compound is liberated in the skin of human beings, dogs, and other animals under the influence of thermal trauma. It may be that under conditions not known as yet, the absorption of this substance may vary, or deeper burns may destroy it. The rectal temperature of the dogs was not changed materially following burns. The authors do not believe that the intensity and duration of the burns were sufficient to raise the intra-abdominal temperature and thus affect the secretions.

A considerable increase in intra-abdominal pressure and in gastric motility was observed following burns; the motility was particularly strong in the pyloric antrum and began immediately after starting of the burn. Section of the splanchnic nerves and of the vagi, or of both, did not diminish or abolish gastric motility following burns. Section of the vagi seemed to enhance the gastric motor response to a burn. The intravenous injection of atropine sulfate abolished the motility of the stomach following a burn.

The increase in gastric motility following a burn cannot be attributed to histamine or like substances for the following reasons:

Histamine has little or no effect on gastric motility and the response of the stomach to histamine is not abolished by relatively small doses of atropine. The prompt depressing effect of atropine on gastric motility points to the presence of compounds of the nature of acetylcholine. These may be liberated by burns or, more probably, the acetylcholine-splitting esterase may be inhibited following a burn. Acetylcholine injected either continuously or in repeated doses is able to elicit gastric secretion as well as motility and it is possible that both gastric secretion and motility may be largely stimulated by that one compound. The simultaneous decrease in stimulated salivary (except in 1 experiment) and pancreatic secretions and the increase in gastric se-

cretion following burns cannot be explained at the present time. JOSEPH K. NARAT, M.D.

Boyce, F. W.: The Hepatic (Hepatorenal) Factor in Burns. *Arch. Surg.*, 1942, 44: 799.

The mortality for 1,243 burns treated at the Charity Hospital of Louisiana in New Orleans during the six and one-half years ending June 30, 1941, was 217—a mortality rate of 17.45 per cent. This figure compares favorably with those from other institutions treating a large number of similar cases. The author was able to estimate the extent of body surface involved in 215 of the 217 fatal cases. In only 78 patients was over 50 per cent of the body surface involved. In 14 patients who died only 15 per cent and in 9 only 10 per cent of the body surface was involved. In many of the fatal cases the burns were of the first and second degrees. Such facts suggest that consideration other than merely physical factors of extent and depth enter into the matter of mortality from burns.

Persons at the extremes of life are particularly susceptible to death from burns. Over 25 per cent of the deaths in this series were in children under five years of age and approximately 20 per cent were in patients over seventy years of age.

The author discusses the toxic theory of death from burns. He points out how few people have paid attention to the extensive liver damage that was present in a vast majority of cases that had clinical evidence of severe toxemia before death. The clinical picture of toxemia in burned subjects bears a striking resemblance to the clinical picture in such definitely hepatic states as the so-called "liver deaths" or "liver-kidney" syndrome.

The clinical picture of the so-called toxemia in burns is generally agreed upon. A change in the mental state is one of the first symptoms. The patient may become restless, irritable, and apprehensive in turn. He is first drowsy and then comatose, or he may pass from disorientation into delirium, which may be extreme and which is always a bad sign, particularly if it occurs early. Convulsions are frequent in young children. The fever mounts rapidly, the temperature reaches 105°F. or higher, and the pulse and respiration are correspondingly rapid, although the respiration is not otherwise altered. Vomiting is usually present. The skin and mucous membranes have a cyanotic or grayish tinge, the eyes are sunken, and the pupils are dilated. In the fatal cases death is seldom long deferred.

The most obvious manifestation of the hepatic lesion is the development of jaundice. In practically every instance, although the cases were not numerous, in which the author made liver-function tests, there was some degree of functional impairment. This degree of liver impairment could frequently, although not constantly, be roughly correlated to the surface area involved and the depth of the lesion.

The liver lesions vary from extreme changes comparable to those of acute yellow atrophy to serious inflammation, cloudy swelling, or fatty metamorphosis.

There may be albuminuria and hematuria. Oliguria and even anuria are not extremely uncommon. The author states that deaths which occur promptly after burns, with hyperpyrexia and hepatic necrosis as the outstanding features, correspond to the so-called "liver deaths." Deferred deaths, in which the renal factor is outstanding and post-mortem examination reveals pathological changes in both the liver and the convoluted tubules of the kidney, correspond to the so-called "liver-kidney" syndrome.

Treatment of burns should be based on the reduction of toxemia by the use of a tanning agent. Plasma should be administered on a strictly calculated basis. The administration of dextrose must be carried out if the theory of hepatic damage is accepted—oral administration is preferable when it can be used. Anesthesia for preliminary débridement and cleansing should be avoided whenever possible. Sulfanilamide and its derivatives must be used with caution because of their possible toxic effects on the liver. EARL O. LATIMER, M.D.

Martin, J. D., Jr.: Experience in the Treatment of Burns. *South. M. J.*, 1942, 35: 513.

The universally high mortality rate from burns is substantiated by a yearly mortality of 200 in Georgia. Recently, the treatment of burns has been directed on a more scientific basis. This has been brought about by the realization that there are 3 periods following an injury of this type. These are, in their respective order of development, (1) shock; (2) the so-called toxic stage; and (3) the infectious or septic period.

Shock results from the hemoconcentration associated with a decrease of blood volume and cardiac output. This is proportional to the fluid loss into the tissues resulting from an increased permeability of the capillaries, with chlorides and proteins passing into the tissues. It has been shown that 140 per cent concentration of the blood occurs before cellular changes take place.

The toxic stage may be due to cellular changes. The question of the existence of toxic material which can produce tissue destruction has not been entirely disproved.

During the past ten years, 1,875 burn cases have been admitted to the Grady Hospital, Atlanta, Georgia. An analysis of these cases which were treated by the tannic-acid method showed that the mortality in children under six years of age was approximately 30 per cent. The most frequent cause of the burn in adults is an open flame, whereas children are most frequently scalded. Approximately one-fifth of the 94 mortalities occurred within twelve hours of the accident, and the majority of the deaths took place between the twelfth hour and the fifth day. Fatal complications such as pneumonia, nephritis, and sepsis decreased after the fifth day.

In the treatment of burns, each case must be considered individually. The success or failure of any

of the accepted methods of local treatment will depend more on the detailed care given than on the method itself. The author lists the following advantages to be obtained by the use of tannic acid, gentian violet, triple dye, and other substances:

1. To give immediate comfort to the patient by excluding air from the surface.
2. To decrease loss of body fluids from the surface.
3. To prevent further trauma to the injured tissue cells.
4. To lessen infection, thereby decreasing the scar.
5. To obviate the necessity of repeated painful dressings, thus lowering the cost of treatment.

Plasma is the substitution fluid of choice in combating secondary shock. However, during the second and third stages of the burn a progressive anemia frequently develops. Whole blood is indicated to combat this anemia.

Local therapy for burns may be classified as follows:

1. The inclusive dressing, of which tannic acid, gentian violet, triple dye and, most recently, 3 per cent sulfadiazine in 8 per cent triethanolamine, are the best examples.
2. Wet dressings.
3. Oily dressings.

In conclusion the authors point out the necessity of exercising the greatest possible care in the treatment of burns. ALFRED B. LONGACRE, M.D.

Allen, J. G., Owens, F. M. Jr., Evans, B. H., and Dragstedt, L. R.: Sulfathiazole Ointment in the Treatment of Burns. *Arch. Surg.*, 1942, 44: 819.

The authors report the use during ten months of a sulfathiazole ointment in the treatment of superficial ulcerating areas, abrasions, and infected superficial wounds, and of the impregnation of gauze packs used in various infected surgical wounds. They state that, by and large, the results were gratifying. The greatest benefits were obtained in infections due to staphylococci, streptococci, or colon bacilli, and the least effect was observed in wounds infected with the common anaerobic organisms. The importance of plasma is emphasized in the case of thermal injuries, and guides to the administration of plasma are presented.

The case histories of 2 severely burned patients are summarized. Sulfathiazole ointment compounded so that 20 per cent of the drug is contained in an oxycholesterol-petrolatum base is advocated for thermal as well as for other cutaneous injuries.

WALTER H. NADLER, M.D.

Adams, W. M., and Crawford, J. K.: The Sulfadiazine Treatment of Burns. *South. Surgeon*, 1942, 11: 324.

Burns are open wounds of the skin, and often of the subcutaneous tissues as well, and are subject to infection and other complications. The treatment, therefore, must be governed by the cause, degree, and location of the burn, the presence of infection, and other factors. In general, current procedures are of two types: open and closed. The open method of treatment is one of the oldest in use, and has not been surpassed in the management of infected burns and those of third degree. The closed treatment by the various escharotics presents disadvantages because of the thick leathery eschar which conceals infection, because of the staining by the dyes of everything with which they come in contact, and because of the constricting effect of the eschar which may cause gangrene of an extremity.

Because of Pickrell's success with a preparation of 3 per cent sulfadiazine and 8 per cent triethanolamine, the authors have used it in treating 50 patients since October, 1941, at the John Gaston Hospital and the Methodist Hospital at Memphis, Tennessee. On admission the patient is treated for shock, and cultures are taken of the burned areas. When the general condition permits, a thorough débridement is carried out and the surfaces are cleansed with soap and water. In a bed covered with sterile sheets and a warm cradle, the sulfadiazine preparation is sprayed on to the burned areas every hour for the first day, every two hours the second day, and at less frequent intervals on subsequent days, until the thin flexible eschar is formed. A window is cut through the transparent eschar if there is evidence of infection, and a wet dressing is applied. In all extensive third-degree burns, the eschar is removed as soon as the acute stage has subsided, and treatment with wet dressings is instituted to prepare the wound for grafting. A record of fluid intake and output is kept, as well as daily urinalyses, blood counts, and record of sulfadiazine concentration. Good nursing care and a diet high in protein and vitamins are important. Adrenocortex hormone has been given to patients who exhibit shock, and sulfonamide has been given by mouth for complicating infections. Almost without exception these patients have been partially or completely relieved of pain after the first few applications of the sulfadiazine solution. We do not recommend that the sulfadiazine solution be applied to fingers or toes when the entire digital circumference is involved. Sulfadiazine ointment or wet dressings are more suitable for such areas, and are also preferable for the treatment of facial burns.

Initial cultures were positive without exception for staphylococcus aureus, nonhemolytic streptococcus, bacillus subtilis, and bacillus pyocyaneus. In only 3 cases was there any toxic reaction attributable to the drug.

Of the 50 patients comprising this study, all of whom had burns sufficiently severe to necessitate hospitalization, 31 have been discharged as completely healed. Nine are in the hospital at the present time; of these, 3 are being prepared for skin grafting. Ten of the 50 cases terminated fatally. Percentages of body surface burned were determined from a chart which accompanied the record of each case.

The authors believe that the mortality of 20 per cent in the series of 50 patients who were treated in

the hospital is misleading. Not only the extent of the surface involved, but also the degree and location of the burn, its condition at the time of the patient's admission to the hospital, the length of time which has elapsed since the injury, and the physical condition of the patient as to age, state of nutrition, and degree of shock must be considered.

In view of the advantages, the authors are convinced that the drug deserves a thorough trial. They therefore plan to continue the treatment and to use a modified formula composed of 1.5 per cent sulfadiazine in 5 per cent triethanolamine, with the addition of aerosol, methocel, and sodium benzoate, which is reported to make a more quickly drying eschar. BRADFORD CANNON, M.D.

Siler, V. E., and Reid, M. R.: Clinical and Experimental Studies with the Koch Method of Treatment of Heat Burns. *Ann. Surg.*, 1942, 115: 1106.

The authors state that Koch and others have advocated that the treatment of burns should employ the fundamental surgical principles which are applied to the treatment of wounds in general. They then give reports of clinical observations which are divided into 3 periods: (1) preoperative, (2) operative, and (3) postoperative.

The major factors to keep in mind during the preoperative phase of burns include treatment of the patient's general condition and the exercise of precautions to prevent further wound contamination. The preliminary, or first-aid treatment, should be directed toward keeping the patient warm and giving him adequate morphine. Instead of the usual treatment with ointments, oils, and other home remedies, local therapy should consist of covering the burned area with a dry clean sheet, a piece of cloth, or a towel, if sterile dry dressings are not available. Immediately upon admission of the patient to the hospital, hematocrit and plasma-protein determinations are made. The administration of intravenous therapy is guided by these findings. However, in cases in which the burn involves 25 per cent or more of the body surface, plasma administration is started immediately.

Absolute asepsis is mandatory in the operative procedures. The patient is placed on a sterile sheet. General anesthesia is employed in the majority of cases. The wound is then thoroughly washed by the operating team, the personnel of which have been previously scrubbed, gowned, and gloved. White soap and water are used for the washing of the burn. At this stage gross débridement is performed. Upon the completion of this preliminary cleansing of the wound, the entire procedure is repeated. This includes regowning and regloving of the operating team, as well as redraping of the patient. During the second cleansing a more minute débridement is performed. When this step is complete the wound is covered with sterile fine-meshed vaseline gauze over which are placed flat gauze dressings and fluffed sponges. Pressure is then exerted by applying a folded gauze roll. Further pressure is obtained by placing sterile mechanic's waste over the entire region. Adhesive is placed over the entire dressing to maintain the dressing and to eliminate motion of the dressing. This dressing is left untouched for from ten to fourteen days, unless the patient's condition indicates that it should be changed at an earlier date. Upon removal of the dressing at the usual time of from ten to fourteen days, most first- and second-degree burns will be completely healed; in the case of third-degree burns, the granulating surface is usually ready for a graft.

The principal features of the postoperative regime consist of adequate nursing care, maintenance of fluid balance, and observations for complications.

The authors report a series of 134 cases of burns treated in the manner outlined. Of these, 43 were of first or second degree, 13 were of third degree, and 78 were burns which included areas showing first-, second-, and third-degree burns. In this group there were 5 deaths: 1 from a cerebral accident on the fourth day; 1 from asphyxia within three hours; 1 from pneumonia and pericarditis on the fourteenth day; 1 with hyperpyrexia at twelve hours; and 1 not explained. Among the survivals, 58.9 per cent of the burns healed without infection, whereas 29.7 per cent showed mild to gross infection; in 11.1 per cent of the cases the result is unknown.

The authors pointed out that some of the advantages of a pressure dressing in the treatment of burns are: (a) the patient is able to assume his own fluid balance by the oral route very rapidly, (b) the infrequency of the dressings lessens the risk of secondary infection, (c) suffering is rapidly relieved, and (d) there is a great economic saving both as a result of the relatively few dressings and a shorter hospital stay.

Observations were made on the effect of pressure dressings in the treatment of burns experimentally produced on dogs. The 12 dogs used in the experiment were divided into 6 pairs. Prior to production of the burn, preliminary determinations of the hematocrit and plasma protein levels of the dogs established a normal base line for the experimental animal. After proper preparation of the experimental area, a burn was produced with a gas-oxygen flame. One dog of each pair was treated by the application of a pressure dressing enclosed in a plaster cast, whereas no dressing was applied to the burn of the other dog. Hematocrit and plasma protein levels were determined every hour for three hours, and then every two hours until a total of 8 determinations had been obtained.

These determinations showed a hemoconcentration as well as a decrease in the plasma protein level in all of the animals. However, these changes not only occurred more rapidly, but were of greater magnitude in the animals without a dressing as compared to those in the animals with a pressure dressing. The greatest point of hemoconcentration was observed to occur between four and six hours after the injury. The general condition of the dogs

indicated that those with the pressure dressings suffered less thermal shock and were more comfortable than those without the dressing.

The authors conclude that the data reported suggests that a primary pressure dressing may reduce the loss of plasma protein at the site and in the surrounding tissues of burned areas. The capillary hematocrit method of determining the hemoconcentration is of advantage in that it requires less blood, is rapid, and is more accurate than other methods generally employed. ALFRED B. LONGACRE, M.D.

Altemeier, W. A., and Carter, B. N.: Infected Burns with Hemorrhage. *Ann. Surg.*, 1942, 115: 1118.

The persistent hemorrhage which occasionally complicates an infected burn usually results in a marked anemia, low serum protein levels, mental depression, and a marked tendency to develop contractures. "A vicious cycle becomes established—the more the patient bleeds, the greater the infection becomes as a result of the anemia, low plasma proteins and debility; and the greater the infection becomes the more the patient bleeds."

The authors report 3 cases of chronically infected burns which were characterized by a continuous ooze of blood for varying periods up to five or six months. Local applications of lanolin or vaseline pressure dressings, or of solutions of boric acid, Burow's solution, Dakin's azochloramide, dilute acetic acid, mercurochrome, hydrogen peroxide, silver nitrate, 1 per cent copper, and of Burow's solution, as well as the systemic and local application of sulfonamides failed to control or clear the bleeding. In each instance the application of zinc-peroxide dressings dramatically stopped the bleeding within from twenty-four to forty-eight hours.

In each of the cases the bleeding was associated with chronic infection and was not to be confused with bleeding which may result from a depressed prothrombin level or the separation of large infected sloughs. The continued oozing of blood from the infected granulations suggested that the hemorrhage was of the capillary type and might have been the result of damage to the capillaries by bacterial toxins. The rapid cessation of hemorrhage once the infection was controlled by zinc peroxide indicated that the bactericidal and detoxifying properties of this antiseptic are responsible for its effectiveness.

Bacteriological studies of the cases reported are included in the following table:

TABLE I. Bacteria Isolated from Bleeding Burns

CASE 1.	Hemolytic staphylococcus aureus Nonhemolytic staphylococcus aureus Nonhemolytic anaerobic streptococcus
CASE 2.	Hemolytic staphylococcus aureus Streptococcus fecalis Nonhemolytic staphylococcus albus
CASE 3.	Hemolytic staphylococcus aureus Hemolytic streptococcus Hemolytic bacillus coli

The relation of the various bacteria in the production of hemorrhage is not known. Attempts to reproduce this hemorrhage experimentally in animals have not been successful; consequently the exact mechanism by which zinc peroxide acts is not entirely clear. The authors have been able to demonstrate a destruction of the hemolysin of the staphylococcus and bacillus coli as well as of the streptococcus by contact with zinc peroxide.

ALFRED B. LONGACRE, M.D.

Brown, J. B., and McDowell, F.: Epithelial Healing and the Transplantation of Skin. *Ann. Surg.*, 1942, 115: 1166.

Microscopic sections of epithelial repair were made in a large number of patients over a seventeen-year period. These studies form the basis of a number of observations.

Skin is a complex organ, and epithelium is the only part that regenerates. The pad of derma, which is of greatest importance for bearing protection, does not regenerate, hence the claim that this or that chemical will produce healing without scarring is absurd. Clinically, there is great individual variation in the ability to heal. Some patients will heal full-thickness losses with good bearing function, others produce an excess of scarring with marked deformities, while still others show little or no tendency to grow new epithelium. Biopsies of the edges of ulcers in various individuals may show (1) no epithelial activity, (2) excessive keratosis, or (3) breaking up of the epithelial cells with apparent invasion of the deeper fibrous tissue. Deep fibrous tissue may fill in large defects under the skin, but it often becomes so thick and avascular that it cannot support its covering epithelium. It is the failure to remove this deep scar which accounts for many failures of grafts on chronic leg ulcers.

Burns can usually be made ready for the transplantation of grafts to them in from twenty to thirty days. Transplanting a thick split graft is the procedure of choice if extensive surfaces must be covered. The graft must include a portion of derma. The original Ollier-Thiersch graft was too thin, and did not include enough derma. The essential difference between "scar epithelium" and grafts lies in the protective pad of derma under the epithelium. Biopsies of thick split grafts show that the derma survives, and the overlying epithelium is normal in every respect, with normal papillae and no excessive keratin.

In preparing beds for grafts, it is often advisable to slice the granulations cleanly off with a graft knife. Grafts will not grow on tendon or bare cortical bone, although such a defect of as much as 1 cm. in diameter may be covered because of the lateral blood supply which keeps the graft viable. Sulfanilamide is used sparingly. Grease under a graft precludes its growth. Pressure dressings are essential for the survival of the grafts.

Donor sites after the removal of grafts resemble in many ways a superficial burn or a deep abrasion. If the sites are kept sterile and no harmful chemicals are employed, healing takes place by the spreading

of the deep glandular epithelium of the derma over the surface. This process occurs in about six days. Biopsies of donor sites show that the epithelium of the dermal glands "dedifferentiates" into true surface epithelium in about nine days, with the formation of papillae and keratin, provided the raw surfaces are not injured by chemicals, infection, or trauma. The skin of the back is ideal for thick split grafts because of the thick derma present. On the other hand, the epithelium of the back has little chance of survival as a free full-thickness graft from this area because of the thickness of the derma. A thigh or the lower abdomen should be saved for subsequent full-thickness grafts should such grafts be needed.

Homografts survive for as long as eleven weeks, and then completely disappear. Biopsies show interstitial edema under homografts. Later, cellular infiltration occurs under the homograft, and the various dermal and epithelial elements begin to disappear. Homografts in identical twins may survive, however.

Skin grafts appear to grow and stretch out, so that if a graft is successful at the beginning, it is apt to remain so. Metaplasia of grafts does not take place, and regardless of where the graft is transplanted, it will retain its original characteristics.

Finally, the authors suggest various lines of investigation regarding burns and grafts, since it is pointed out that there is vast room for improvement in these fields. LUTHER H. WOLFF, M.D.

Nason, L. H.: Keloids and Their Treatment. *N. England J. M.*, 1942, 226: 883.

Keloids are exaggerated growths of scar tissue. They occur as a result of trauma in relatively young individuals, and there is a wide individual and racial susceptibility. Certain local factors, particularly the manner in which local skin tension is applied, are also determining factors in the occurrence of keloids. Areas in which skin tension is constant are more likely to be the site of keloid formation than are areas in which skin tension is constantly changing, such as body creases.

The suggested treatments for keloids have been numerous and, heretofore, uniformly disappointing. The author successfully treated 51 keloids in 49 cases by carefully following certain definite surgical principles. In general, these consisted of:

1. Sharp knife excision. It was often necessary to change the direction of the skin tension by the use of Z-shaped incisions, closure of the incised area without tension by means of V-shaped incisions parallel to the long scar of the keloid, or even skin grafting.
2. Sharp cutting, the use of small suture needles, and fine dermal plastic sutures.
3. Accurate skin-edge approximation and early removal of sutures (in from twenty-four to forty-eight hours).
4. Pressure dressings (some keloids can be removed without resorting to surgery).
5. Small doses of roentgen rays from three to five days following operation.

HOWARD A. LINDBERG, M.D.

Boyce, F. F.: Human Bites: An Analysis of 90 (Chiefly Delayed and Late) Cases from Charity Hospital of Louisiana at New Orleans. *South. M. J.*, 1942, 35: 631.

Infections due to human bites or injuries by human teeth constitute a definite pathological entity, which is by no means infrequent. A series of 90 cases, all but 3 of which were delayed or late cases, is added from the New Orleans Charity Hospital to the cases already on record.

Although bacteriological studies in most reported series are incomplete, there is no doubt that the organisms in the human mouth, chiefly the fusiform bacilli and spirochetes in symbiosis, various streptococci, and sometimes other organisms, are responsible for the seriousness of this type of infection. For anatomical reasons bites on the hand, particularly over the knuckles, are most serious of all, because the causative organisms thrive best in the conditions created by such injuries, namely: devitalized tissue and lack of air.

Treatment of early cases is based upon two principles, the conversion of the airless condition to an open one, and the excision of devitalized tissue in which bacteria might grow in symbiosis. Treatment of late cases depends upon the conditions present, and frequently must be mutilating.

Human-bite infections are potentially serious. They may incapacitate the patient for a long period of time, and they frequently end in functional disability or actual mutilation. Occasionally fatal cases have also been recorded. These results, however, rarely occur in promptly recognized and properly treated injuries, and the remedy for this unfortunate state of affairs is, therefore, the treatment of early cases on the principles outlined.

J. M. MORA, M.D.

Chambers, L. A., Harris, T. N., Schumann, F., and Ferguson, L. K.: The Use of Microcrystals of Sulfathiazole in Surgery. *J. Am. M. Ass.*, 1942, 119: 324.

The preparation of microcrystalline sulfonamides consists in the neutralization at low temperatures of a solution of the sodium salt of the drug, the reacting mixture being kept in violent agitation by sonic vibration. Aqueous suspensions in concentrations up to 30 per cent are stable. Removal of the water and drying of the powder yields a crystalline preparation which is of advantage in restricted therapeutic procedures.

When used locally, sulfathiazole has the advantage over sulfanilamide of being effective against a larger variety of organisms. The chief disadvantage of sulfathiazole is its tendency to clump and form an insoluble mass which acts as a foreign body in the tissues. However, this disadvantage is obviated when microcrystalline sulfathiazole is used

in powder form or saline suspension. This form of sulfathiazole permits rapid and effective absorption and allows full benefit of its action on a large variety of organisms. The authors report favorable results from the use of microsulfathiazole in traumatic wounds and infections. EARL GARSIDE, M.D.

Glicklich, E. A.: Sulfathiazole Ointment in the Treatment of Pyogenic Dermatoses. *N. England J. M.*, 1942, 226: 981.

Results from the local use of sulfathiazole ointment in 42 patients are reported. The series comprised 8 different dermatological diseases caused by or secondarily infected with pyogenic organisms, and included 20 cases of impetigo, 7 of pyoderma, and 7 of eczematoid dermatitis. Cultures made in 11 of the cases revealed a hemolytic staphylococcus aureus. Both a crude ointment and refined ointments containing 5, 10, and 15 per cent suspensions of sulfathiazole were used. The strength of the drug made little difference. The infections cleared up more quickly, as a rule, than infections treated by other means. No toxic effects were observed. The application of sulfathiazole to the skin for forty-eight hours caused only insignificant amounts of the drug in the blood stream. The author believes that the use of the sulfonamides orally is not warranted in the treatment of minor pyogenic dermatoses.

WALTER H. NADLER, M.D.

ANESTHESIA

Lyford, J., III, Berger, O. L., and Shumacker, H. B., Jr.: An Analysis of Deaths in the Operating Rooms of the Johns Hopkins Hospital, with Special Reference to Those Occurring under General Anesthesia and Spinal Anesthesia. *Bull. Johns Hopkins Hosp.*, 1942, 70: 488.

A total of 75 deaths in the operating room occurred during the administration of 51,392 anesthetics in the Johns Hopkins Hospital from 1931 to 1941. The operating-room mortality was 0.015 per cent and the gross anesthetic mortality was 0.039 per cent; of these deaths, 55 were not related to the anesthetic. In the latter group were included 29 deaths occurring during the course of intracranial surgery and 16 deaths during thoracic surgery. The common factor in the death of most of these patients was a serious illness which required operation.

The 20 deaths related to the administration of the anesthetic were associated with such factors as respiratory obstruction, spinal anesthesia, and errors in the technique of the administration of the inhalation anesthetic; 1 death was due to explosion of the anesthetic mixture. Eleven of the 20 deaths might have been avoided by more careful preoperative care of emergency cases for general anesthesia, gastric decompression, and the maintenance of a clear airway. The spinal deaths seemed to warrant a more careful selection of the anesthetic, since all these patients were in poor condition and suffered from hypertension.

No definite cause could be found to explain the death of 9 patients. It was believed, however, that the poor preoperative condition of the patient was a major contributory factor since no other cause was apparent. It was suggested that carotid-sinus syncope and laryngospasm might have contributed to these deaths. BENJAMIN G. P. SHAFIROFF, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Bulbulian, A. H.: Congenital and Postoperative Loss of the Ear; Reconstruction by the Prosthetic Method. *J. Am. Dent. Ass.*, 1942, 29: 1161.

Regardless of the cause of deformities of the external ear, the prosthetic method offers a means of reconstruction of a most valuable nature which should be made available to everyone who is in need of it. This service is always greatly appreciated by those who need it, and the one best qualified to give it is the dentist.

It is true that a certain amount of skill and experience is a prerequisite for prosthetic restoration about the head and face; however, aside from this there is another factor which determines the degree of success in a proposed prosthesis, namely, the existing condition of the deformity. This is true because certain types of deformity of the ear are much more favorable for good restorative work both from a cosmetic as well as from a retention standpoint than are others. The most favorable condition for prosthetic reconstruction of the missing ear is one in which the entire auricle is absent with the exception of the tragus and the deep portion of the funnel-shaped opening leading to the external auditory canal, the concha.

When the opening into the external auditory canal is partly or entirely closed over during the process of healing following an injury, the problem of retention of the prosthetic ear is somewhat difficult. In such a case the presence of firm and irregular scars at the site of the original ear is helpful in retaining the ear in position as well as in aiding the wearer of the prosthesis to place the artificial ear in the correct position; however, in addition to this, the use of some

Fig. 1. a, Loss of right ear as a result of trauma. b, Patient wearing prosthetic ear.

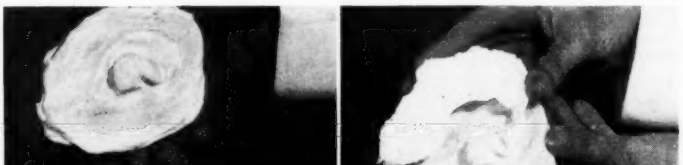

Fig. 2. a, Two sections of mold separated. b, Two sections of mold assembled and pieces ready to be fitted together.

kind of liquid adhesive must be relied upon as the main retaining method.

While the patient is in the chair during the taking of the impression of the deformity, it is a good practice to take an impression of the normal ear on the opposite side. The use of plaster-of-Paris in taking impressions of the normal ear is preferred to the use of hydrocolloidal material. A good impression of the entire ear can be obtained in two pieces with plaster-of-Paris.

The technique of making a prosthetic ear by either the latex method or methyl methacrylate method or any other method is identical up to the point of obtaining an accurate wax pattern for the prosthetic ear. If the prosthesis is to be made of latex, the final mold has to be made so that it may be suitably used for pouring the latex compound, but if the prosthesis is to be made of acrylic resin the mold has to be made so that it can be flasked and the processing of the material carried on according to the standard manner of manipulating this material.

The author's experience with latex, one of the flexible materials, in the reconstruction of facial deformities has convinced him of the superiority of latex over any other material, but he is at the same time fully aware of the good cosmetic results that can be obtained with the new acrylic resin, an example of a rigid type of material.

Jenkins, H. P., and Hrdina, L. S.: Absorption of Surgical Gut (Catgut). Pepsin Digestion Tests for Evaluation of the Duration of Tensile Strength in the Tissues. *Arch. Surg.*, 1942, 44: 984.

A method of assaying the resistance of surgical gut (catgut) to digestion is described by Jenkins and Hrdina as the "two gm. suspension pepsin digestion test." This consists of suspending a strand of catgut in a glass cylinder by a 2-gm. weight and subjecting the catgut to the action of a solution of from 0.35 to 0.37 per cent hydrochloric acid and 10 per cent pepsin incubated at 37° C. until the catgut becomes sufficiently digested to break.

The digestion time in acid-pepsin solution was determined for the surgical gut of 10 different manufacturers. Most of the products were studied over a period of three or four years and approximately 3,200 digestion tests were completed.

By the 2-gm. suspension test, plain catgut was found to have an average digestion time of about eleven hours, although the tests on certain products lasted twenty hours or more. Chromic catgut was found to have a rather wide range of variation, the digestion time depending on the size of the catgut and the particular product. The average digestion time of the chromic or tanned catgut of most companies was in excess of twenty hours, although the products of 2 companies were digested in a length of time which approximated the average observed for plain catgut. There were relatively minor differences in the digestion time of the twenty-day and forty-day chromic catgut of any one company when similar sizes were compared; however, there was often a conspicuously prolonged digestion time observed for the smaller sizes of chromic catgut of some companies.

The digestion time in pepsin by the 2-gm. suspension test was correlated with previously reported observations on the decline in tensile strength of catgut in the tissues. It was found that for the most part the digestion time in acid-pepsin solution in hours was approximately twice the number of days of duration of the tensile strength in the tissues. Thus a digestion time of ten hours would indicate a surgical gut which might be expected to hold up for five days; twenty hours would indicate ten days' duration of tensile strength, and so on. Although this relation was found to be moderately accurate for most surgical gut products, there were some discrepancies observed. Furthermore, the relation described would, of course, be materially influenced by the digestive potency of the pepsin used in duplicating these tests. A method of obviating, at least to some extent, the

factor of variability of the digestive agent is suggested by the authors in the original article.

STEPHEN A. ZIEMAN, M.D.

Koontz, A. R., and Shackelford, R. T.: The Tissue Reaction to Ribbon Catgut and Preserved Ox Fascia-Lata Strips. *Ann. Surg.*, 1942, 115: 1186.

Because of the known tendency of catgut to be absorbed, the authors wondered if preserved fascia-lata strips would not serve for suture material better than ribbon catgut. They consequently conducted some experiments upon dogs in order to determine the differences in the tissue reaction to ribbon gut and to ox fascia-lata strips.

The results obtained with the ribbon gut were very similar to those obtained with ordinary catgut. Doubtless, the chemicals with which catgut is treated in its preparation have something to do with its absorption. Also, the catgut is heated in the process of preparation, which alters the physical state of the collagen fibrils.

The authors found that no such chemical or physical alteration takes place in the collagen fibrils of the preserved fascia-lata strips. Besides, the strips are soft and pliable and lend themselves readily to the ingrowth of fibroblasts from the surrounding tissues, while catgut is so hardened that it would be impossible for fibroblasts from the surrounding tissues to grow into it, even if there were no complicating physical and chemical alteration of the fibrous framework.

The authors conclude that strips of preserved ox fascia lata offer the same advantages as ribbon catgut as a suture material with the additional advantages of not being absorbed and, by virtue of the invasion of fibroblasts from the surrounding tissues, of persisting as a living suture with an apparently undiminished tensile strength.

J. DANIEL WILLEMS, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Weatherall, M.: The Pharmacological Actions of Some Contrast Media and a Comparison of Their Merits. *Brit. J. Radiol.*, 1942, 15: 129.

The author made an extensive study of the pharmacological actions of various organic iodine compounds used as contrast media in roentgenography. Seven compounds in all have been included in this survey. On the basis of their chemical structure they have been divided as follows:

A. Pyridone derivatives.

Diodone. The diethanolamine salt of 3:5:diiodo-4-pyridone-N-acetic acid, in 35 per cent solution (except where otherwise stated).

Iodoxyl. The disodium salt of 3:5:diiodo-4-pyridoxyl-N-methyl-2:6:dicarboxylic acid, i.e., of 3:5:diiodo-N-methylchelidamic acid, in 75 per cent solution in 10 per cent dextrose.

Sodium iodochelidamate. The disodium salt of 3:5:diiodochelidamic acid, in 20 per cent solution.

B. Benzene derivatives.

Sodium iodohippurate. The (mono) sodium salt of orthoiodohippuric acid in 50 per cent solution.

Compound No. 6. The disodium salt of 3:5:diiodo-p-hydroxyhippuric acid-O-acetic acid in 50 per cent solution.

Compound No. 7. The disodium salt of 3:5:diiodo-p-hydroxybenzoic acid in 20 per cent solution.

Compound No. 8. The disodium salt of 3:5:diiodo-p-hydroxyhippuric acid in 20 per cent solution.

Of these compounds, 3 are in common use: (a) diodone, which is sold under the names of perabrodil, diodrast, pyelosil, and pylumbrin; (b) iodoxyl, sold under the names of uroselectan B, neoiopax, pyelectan, and uropac; and (c) sodium o-iodohippurate sold as hippuran.

The pharmacological investigations included experiments on actions on the heart, blood vessels, blood pressure, and the brain. The method of the experiments as well as the results obtained are described in detail.

The following clinical evaluations were obtained:

Four of the compounds are unsuitable for clinical use. Sodium iodochelidamate acts like iodoxyl, but depresses the heart more strongly. Compound No. 6 produces undesirable reactions. Compounds No. 7 and No. 8 have not been prepared in solutions of sufficient strength to be useful contrast media. Thus there remains the choice between diodone, iodoxyl, and sodium iodohippurate.

In pyelography, diodone and iodoxyl are equally good, although the former is preferred since it stimulates the heart and iodoxyl depresses it and since it does not lead to thrombosis in the vein where it is injected. No direct comparison was made with sodium iodohippurate, but it is surmised that the latter, on account of its lesser opacity and inefficient concentration in the kidneys, constitutes a poorer pyelographic medium.

For outlining peripheral blood vessels, the choice lies between a 70 per cent solution of diodone and the ordinary (75 per cent) solution of iodoxyl. Here again, diodone is less injurious locally, it causes less immediate constriction, and its general effect on the circulation and heart is beneficial.

For cardiography, diodone constitutes the only suitable substance.

There remains the problem of cerebral angiography. Compound No. 6, which causes the least disturbance in cats, and which thus seemed to show promise as a new contrast medium, leads to rather severe reactions in human beings. Diodone, which is preferable to iodoxyl and sodium iodohippurate, is harmless when injected into the carotid artery at the rate of ½cc. of a 70 per cent solution per 1 kgm. of body weight (a total of 20 cc. for the average man), and therefore its clinical use is worthy of trial.

T. Leucutia. M.D.

Gardner, W. J., and Nosik, W. A.: Experiences with Encephalography in Cerebellar Tumor. *Am. J. Roentg.*, 1942, 47: 691.

Encephalography was inadvertently employed in 24 cases of subsequently verified cerebellar tumor over a period of ten years. The most common and striking encephalographic finding in these cases was the presence of air over the mesial surfaces of the cerebral hemispheres, outlining the supracallosal and cingulate sulci. The supracallosal sulcus was more rounded and closer to the cranial vault than normally because of the upward bulging of the corpus callosum.

The second most common finding was the presence of a cerebellar hernia which was shown on the films by a filling defect in the triangular portion of the cisterna magna which lies just below the foramen magnum. In practically all cases the pontine cisterns were flatter than normal, as indicated by the proximity of the pons to the clivus. Air entered the ventricles in only 4 cases. All of these characteristic findings are abundantly illustrated in the article. Only 3 of these patients showed any immediate deleterious effects from the encephalographic procedure and only 1 died. Harold C. Ochsner, M.D.

Schwartz, C. W.: Tumors of the Acoustic Nerve. *Am. J. Roentg.*, 1942, 47: 703.

The author believes that the following views are necessary for the adequate examination of a skull in which the presence of a tumor of the eighth nerve is suspected: stereoscopic films of both sides of the head, and films taken in the occipital position, the semilateral (Stenvers) position, the nose-chin (Waters) position, and the brow-nose position. The

last should be taken with the tube centered between the occiput and vertex and tilted caudad about 5 degrees in order to cast the shadow of the petrous pyramids behind the orbits. The petrous pyramids should be sufficiently penetrated to permit the visualization and study of the entire bony portion of the auditory canal. The earliest roentgen evidence of a tumor of the eighth nerve is slight atrophy of the walls of the auditory canal. The next step is an enlargement of the internal auditory meatus with atrophy of its walls. The next stage occurs when the tumor has emerged from the canal and has produced a notchlike defect in the petrous ridge, usually as part of the destructive enlargement of the internal auditory meatus. A slight homolateral atrophy of the dorsum sellae may occur. An encephalogram at this time may show distortion, obliteration, or even a cystic enlargement of the homolateral portion of the cisterna ambiens, and also a distortion of the aqueduct.

The differential diagnosis of acoustic-nerve tumors is discussed in some detail. These tumors constitute about 9 per cent of all intracranial new growths. The treatment of these tumors is primarily surgical.

HAROLD C. OCHSNER, M.D.

Starr, A., Frank, H. A., and Fine, J.: The Venographic Diagnosis of Thrombophlebitis of the Lower Extremities. *J. Am. M. Ass.*, 1942, 118: 1192.

Most pulmonary emboli of extracardiac origin arise from thrombophlebitis in the deep veins of the lower extremities. Division of the femoral vein prevents the passage of an embolus from the leg to the lung, and this procedure has been advocated as the most effective prophylactic against embolism in cases of deep thrombophlebitis. Early recognition of the venous thrombosis is imperative if pulmonary embolism is to be prevented.

The authors describe the venographic technique of Bauer, by means of which deep venous thrombosis can be demonstrated. The patient lies on his back with a 6 cm. block heel. A 14 by 17 x-ray film is placed under the leg, its lower edge about 3 in. above the ankle. A constant small vein which communicates readily with the deep system is found through a small incision about 1 cm. behind the external malleolus. Twenty cubic centimeters of 35 per cent diodrast are injected into the vein through a fine needle at a uniform rate during a period of sixty seconds. The exposure is made at the end of the injection; the foot is held in moderate inversion in order that the shadow of the veins will not be obscured by that of the bones of the leg. Phlebitis at the site of injection has not been observed, but the vein is washed out with saline solution after the diodrast injection.

In the presence of deep thrombosis, there is often increased caliber of the veins at the ankle, and resistance to the injection may be increased. Thrombophlebitis is characterized by partial or complete absence of filling of the deep veins with the contrast medium. Superficial collateral channels, more evident in long-standing deep thrombophlebitis, may be seen even in the acute stage. The identical pattern of normal filling or of a filling defect is reproduced when the venogram is repeated. A number of cases is reported, and the venographic findings are illustrated.

This method is a reliable means of establishing the diagnosis of thrombophlebitis in the deep veins of the leg even when the signs and symptoms are inconclusive or absent. HAROLD C. OCHSNER, M.D.

Levitt, W. M., and Gillies, Sir H.: Roentgen Therapy in the Prophylaxis and Treatment of Keloid. *Lancet*, Lond., 1942, 242: 440.

The authors found that the optimum dose of roentgen irradiation for the treatment of a developing keloid was about that of an erythema dose.

A series of cases in which keloid might be expected to follow operation was submitted to irradiation with this dosage applied in such a manner as to be limited to the line of the proposed incision. The operation was performed during the period of active erythema, five to ten days after the irradiation, since this is the period when resolution begins in the developed keloid. It was found that the incidence of keloid was reduced to almost negligible proportions by the preoperative irradiation, although occasionally thickening of the scar occurred at a later stage of healing. For this reason postoperative irradiation has been given, and it was found that the thickening can be eliminated by the use of this in combination with the preoperative treatment. Postoperative treatment alone has in some cases been effective in preventing the appearance of keloid, although the results are not so good as they are when preoperative treatment is also used.

In the treatment of the developed keloid, eighteen months or more must be allowed before the full result is seen. Definite improvement should occur in six months but the absorptive changes go on for a much longer period. When no improvement is observed after three months, favorable response to further treatment is unlikely.

The sequence of events after irradiation of a typical fleshy keloid is as follows: no favorable change occurs for the first five to ten days; as soon as the erythema appears the scar begins to soften slowly, and this softening continues for a period of months. The scar ultimately becomes replaced by a flat white area which in its superficial extent is equal to that of the original scar.

The authors believe that x-ray therapy may be very helpful in the treatment of war emergencies, such as multiple small-splinter injuries due to high explosives, and massive keloidal scarring following burns and scalds. HAROLD C. OCHSNER, M.D.

O'Brien, F. W.: The Place of Irradiation in the Treatment of Cancer of the Breast. *Radiology*, 1942, 38: 524.

The author considers the advisability of irradiation therapy in the treatment of various phases of

cancer of the breast. He believes that the frankly inoperable tumors receive enough palliative benefit to justify radiation therapy despite the presence of secondary manifestations. Ulcerating breasts may heal and axillary lymphnode metastases regress.

Localized recurrences in the skin or scar may, if few in number, be excised surgically. They may also be treated by the interstitial application of radium or by intensive roentgen irradiation. The appearance of secondary nodules in the skin or scar usually means that the surgical removal has not been sufficiently extensive.

The possibility of metastasis must be excluded before operation. Roentgen studies of the chest, spine, and pelvis should be made without regard to the smallness of the primary tumor, lack of nodes, or suggestive symptoms. Distant metastases may be controlled for long periods by x-ray irradiation. The fact that metastases are not roentgenographically demonstrable should not prevent irradiation to the site of pain, inasmuch as extensive metastases may be present even though the roentgenographic findings are negative. The progress of lung metastases may be halted by fibrosis deliberately produced by supervoltage irradiation.

In the treatment of primary operable breast cancer, irradiation as the sole therapeutic measure is seldom justifiable; it should be used only in cases which are poor surgical risks, in borderline operable cases, and in especially organized clinics. In the majority of cases, however, radical mastectomy should be performed, the breast, both muscles, and axilla being extirpated. The author believes that preoperative irradiation therapy should be used in an endeavor to immobilize tumors of high malignancy and to improve the cure rate of this group. This can be done without prejudice to rather prompt surgical intervention, and with relatively small amounts of irradiation. Surgical intervention is advisable before the twentieth day after irradiation.

The author believes that in routine postoperative irradiation, the affected chest wall, axilla, supraclavicular chain of lymphatics, mediastinum, and the parasternal nodes and lymphatics of the opposite breast must be treated over a protracted period.

HAROLD C. OCHSNER, M.D.

Howes, W. E., and Bernstein, L.: The Methods Used and the Results Obtained in the Treatment of Widespread Metastases Secondary to Mammary Cancer. *Radiology*, 1942, 38: 562.

Although the ultimate prognosis of mammary carcinoma with widespread metastasis is hopeless, the authors contend that much can often be done in the way of alleviation through direct irradiation of the involved parts. The literature, which tends to confirm this view, is reviewed. Brief consideration is given to other means of relieving pain and producing palliation, such as drugs, operative procedures, orthopedic appliances, physiotherapy and psychotherapy, and radiation castration. Of the various metastases, those of the skin and bones respond most strikingly. Pulmonary, pleural, and even brain lesions may show favorable responses, but liver involvement rarely yields sufficiently favorable results to offset the untoward results which irradiation may cause.

This communication includes a survey of 124 cases with distant metastases. The sites of these are indicated. The age incidence, average life duration after onset of metastases, and life duration after admission with metastases for patients still living are tabulated. Of the patients who had been treated by irradiation, 83 lived for an average period of twenty months, as compared with an estimated five months' survival period for untreated patients.

The technique of irradiation used at the Brooklyn Cancer Institute, Brooklyn, New York, in the group of cases reviewed in this survey is presented. The metastases in these cases occurred in the bones, skin, skull, brain, pituitary gland, mediastinum, lung, pleura, opposite breast, and lymph nodes. Case reports illustrating outstanding improvement and listing the type and extent of radiation therapy used are included.

A. HARTUNG, M.D.

Uhlmann, E.: The Significance and Management of Radiation Injuries. *Radiology*, 1942, 38: 445.

Radiation injuries in both physicians and patients are seen with increasing frequency. Seventy cases have been observed by the author within the last three years. Of this number, 35 occurred in physicians or persons engaged professionally in x-ray work. Only 3 of them occurred in radiologists and they had been exposed to radiation for from twenty to forty years. Four patients were injured by therapeutic measures. The other 28 injuries followed diagnostic or technical x-ray work. An analysis of this group indicated that the majority of the injuries were due to unsatisfactory equipment, insufficient protection, inadequate knowledge of the dangers involved, or simple carelessness.

As far as the nonprofessional patients are concerned, only 6 of this group of 35 were treated by trained radiologists and 4 of these 6 received their treatments for malignant tumors. Of the remaining patients, 9 were injured following diagnostic procedures. Four of them underwent fluoroscopy for the removal of foreign bodies, and the rest were exposed to prolonged fluoroscopy for other purposes. In no instance was a radiologist responsible for injuries occurring in the course of diagnostic procedures.

Radiation injuries of the skin occur invariably at sites where an overdose of x-rays, or the gamma rays of radium have been administered. The characteristics of both early and late lesions and the course usually followed by them are described. Lack of a spontaneous tendency toward healing and resistance to any kind of therapy are largely due to the destruction of the capillary system. In order to treat these lesions effectively, the circulation must be restored. Several methods which have been used with good results in individual cases are mentioned,

but none of them could be expected to be generally successful.

In 1928 the author started to use radon, absorbed in vaseline, for the treatment of x-ray and radium injuries, and during the past thirteen years a large number of patients have been successfully treated. The rationale and technique of the method are described in detail, as are also the preparations of the agents used. Of the patients treated by the method now in use, all who could be kept under personal observation and continuous control were cured. Even of those patients in whom this was not possible, the majority were more or less completely cured and were well satisfied with the results.

A. HARTUNG, M.D.

Leach, J. E., Farrow, J. H., Foote, F. W., Jr., and Wawro, N. W.: Fibrosis of the Lung Following Roentgen Irradiation for Cancer of the Breast. *Am. J. Roentg.*, 1942, 47: 740.

The authors of this article deal with 347 cases of carcinoma of the breast treated between 1926 and 1936, inclusive, on the service of Frank E. Adair at the Memorial Hospital, New York, with some form of radiation therapy. In 77 of the cases, corresponding to 22.1 per cent of the total, there was roentgenographic evidence of pulmonary fibrosis.

The distribution of these cases, based on the type of treatment and magnitude of the dose given is shown in Table I.

TABLE I.—FREQUENCY OF PULMONARY FIBROSIS FOLLOWING VARIOUS TECHNIQUES OF IRRADIATION

Technique	Number of cases	Pulmonary fibrosis
I. Preoperative		
1. Massive doses (500–750 roentgens per portal)	11	1
2. Divided doses (300 roentgens × 6 = 1800 roentgens per portal)	57	31
3. Radium element pack (8000 × 3 = 24000 mgm.-hr. per portal)	31	2
II. Postoperative		
1. Massive doses	77	7
2. Divided doses	41	8
3. Radium element pack	7	0
III. Preoperative and postoperative		
1. Massive doses	37	8
2. Divided doses	3	1
IV. Miscellaneous		
1. Massive doses, interstitial radium, surgery	40	3
2. Divided doses, interstitial radium, surgery	19	8
3. Interstitial radium, surgery	8	1
V. Irradiation only	16	7
Total	347	77

In all of the cases, unless otherwise specified, 200 kv. radiation, filtered with 0.5 mm. of copper and 2 mm. of aluminum, was used. The current amounted to 30 ma., and the skin-target distance to 50 cm. or rarely to 70 cm. The radium treatment was administered with the 4 gm. element pack.

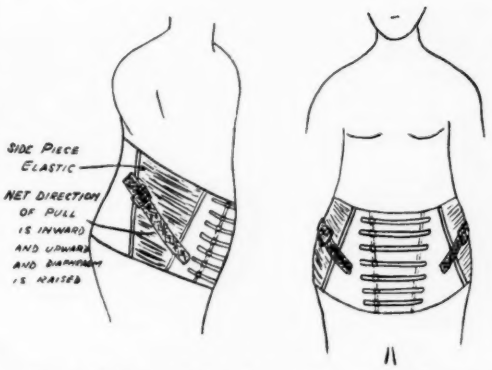

Fig. 1. Diagram of Kerr-Lagen belt. The purpose of this belt is to raise the diaphragm by abdominal pressure and thus increase the vital capacity of the lung. At the same time the patient is forced to use the lower larger portion of the chest for respiration, while the upper more diseased portion of the lung is at relative rest, a fact which reduces the irritable Hering-Breuer reflexes arising in the diseased lung to a minimum. The dyspnea may be further relieved by judicious weight reduction. It was found that in 90 per cent of the cases the cough abated as the dyspnea decreased. At times mild sedative cough mixtures were necessary temporarily.

A study of the table reveals that with the technique employed permanent pulmonary fibrosis constitutes a major complication in cases of mammary carcinoma treated in part or entirely by high-voltage roentgen therapy. Its frequency is definitely greater with the divided dose technique in which large total amounts of radiation are given and large volumes of lung tissue are irradiated. Age does not seem to be a predisposing factor.

The clinical symptomatology in the cases observed was dominated by persistent, slightly productive cough, and dyspnea on exertion and fatigue. Hemoptysis, pain, and palpitation were less common. The claim that heart failure on the right side results from radiation fibrosis could not be confirmed, although alterations in the relationship of the heart to the neighboring structures may result in hypertrophy and, finally, dilatation of the right side of the heart. On a similar basis consistent changes in the electrocardiogram may be observed.

The authors studied in detail the mechanism of the dyspnea. On comparison of the chemical theory of Haldane, Gesell, Howell, and others to the nervous theory formulated by Peabody and later developed by Harrison and his coworkers, they inclined toward the former. Blood samples taken before, immediately after, and ten minutes after exercise and analyzed for carbon dioxide content and pH values showed consistently lower carbon dioxide values and essentially unaltered or higher pH read-

ings after exercise. The vital capacities of the patients were also lowered, often as much as 60 per cent. As a whole, four factors were invoked as the causing agents of the dyspnea: (a) marked diminution of the vital capacity due to the fibrosis itself; (b) fixity of the chest wall; (c) compensatory pulmonary emphysema, and (d) hyperirritable Hering-Breuer reflexes.

The treatment of radiation fibrosis is essentially symptomatic. The authors often obtained good relief from the Kerr-Lagen abdominal belt (Fig. 1).

T. LEUCUTIA, M.D.

RADIUM

Bailey, W., and Kiskadden, W. S.: The Treatment of Hemangiomas, with Special Reference to Unsatisfactory Results. *Radiology*, 1942, 38: 552.

Hemangiomas are reviewed briefly as to incidence and location. Their classification is presented at considerable length because histological structure is deemed of major importance by the authors in the selection of the method of therapy. Capillary hemangiomas or "port-wine stain" lesions having vessels with a well differentiated lining of the adult variety are often resistant to radiation therapy. For the most part, authors are in agreement that surgical excision or cosmetic improvement by means of such pastes as "Cover-mark," is the most satisfactory method of treatment. Hypertrophic endothelial hemangiomas or "strawberry-mark" lesions consisting largely of undifferentiated tumor tissue are usually highly radiosensitive and yield well to radiation therapy. Cavernous hemangiomas are deep-seated lesions, made up of large blood spaces which are lined by endothelium and separated by large connective-tissue septa. In those lesions in which previous biopsy has shown a marked fibrous component, surgical excision has proved preferable to radiation therapy according to the authors' experience.

Most of the unsatisfactory or poor results observed have been due to prolonged procrastination before instituting appropriate treatment, or to the wrong selection of a therapeutic agent. When wrong selections are made it is usually because proper consideration is not given to the depth, extent, and particular type of the lesion.

Treatment by surgery, electrocoagulation, sclerosing solutions, or irradiation is discussed with particular attention to its applicability. The relative advantages and disadvantages of radium and roentgen rays for irradiation are given consideration and preferable methods of administration are discussed. Many hemangiomas are exceptionally sensitive to irradiation, and a trial of roentgen therapy is, therefore, sometimes warranted over very large lesions. Although roentgen therapy is often satisfactory, the gamma rays of radium in the form of well filtered radium packs have, in the authors' experience, given more uniform results. The implantation of weak gold-filtered radon seeds permits a very favorable distribution of the radiant energy. For this reason, and because frequent repetition is not required as with other methods, implantation of radon seeds is often the therapy of choice. Since sensitivity of vascular birthmarks to irradiation decreases inversely with the age of the patient, early treatment is urged.

A. HARTUNG, M.D.

MISCELLANEOUS

Larkin, J. C.: Some Physiological Changes in the Skin Produced by Neutrons. *Am. J. Roentg.*, 1942, 47: 733.

When the skin is subjected to injury its response is much the same whether the injury is produced by heat, cold, inflammation, the Faraday current, injection of chemical substances, a blow, ultraviolet rays, roentgen rays, or neutrons. The erythema which follows depends on the state of the minute vessels of the skin, its time of appearance and of disappearance varying greatly with the different agents. In skin injuries due to heat, cold, scratch, or a mechanical blow the reddening will be seen in a few seconds; ultraviolet rays will produce reddening in a few hours, and roentgen and neutron rays will cause the skin to redden in a few weeks.

The author has studied, by means of various tests, the effects of the neutrons on the capillaries of the skin. Irradiation was carried out with the 60 in. Berkeley cyclotron, and the tests included the scratch test, the injection of vasodilator or vasoconstrictor chemical substances into the skin, and cutaneous temperature tests.

The scratch test, as is known, consists in the drawing of a pointed object over the surface of the skin. Normally the following reactions appear: (1) a white line where the stimulus has been applied, due to contraction of the capillaries once they are stretched by the blood in their lumina beyond a certain limit; (2) a red line, soon replacing the white line, and extending a little beyond, due to liberation by the injured cells of a chemical substance similar to histamine which, in turn, causes vasodilatation and erythema; (3) flare, or diffuse reddening, which is seen a little later just outside of the red line extending many millimeters or even centimeters beyond the line; this is most probably the result of a nervous mechanism; and, finally, (4) the wheal, which is a narrow band of local edema, causing an elevation of several millimeters in the skin, and which often develops in persons with factitious urticaria, or when one presses very firmly in the precise area where the red reaction will appear. It is due to transudation of fluid from the minute vessels and as soon as the fluid diffuses into the surrounding tissues the wheal fades. In applying the scratch test to erythematous areas produced by neutron irradiation, a persistent white reaction was noted as compared to the control areas, which indicated an increased sensitivity of the endothelial tubules. In individuals with factitious urticaria there was little or no wheal formation,

which would suggest that the erythematous skin is refractory to histamine reaction.

To prove the histamine resistance of the erythematous skin beyond doubt, the author placed a 1 to 300 solution of histamine on the skin and pricked it into the subcutaneous area, as well as into a neighboring area outside of the irradiated field. In the control area a typical reaction appeared, which consisted of reddening soon followed by a raised edematous wheal in the center. In the erythematous area there was no wheal formation. That this failure was not due to simple congestion was further elucidated by the injection of vasoconstrictive substances, such as adrenalin or pituitary extract, which still led to no wheal formation.

The skin temperature tests were carried out with thermocouples. Two strips of silver about 1 cm. square were connected with Constantan wire, and 2 copper wires connected the silver plates to the terminals of a very sensitive galvanometer (a Leeds and Northrup Type R). With an ice bath for standard and comparison with another known temperature such as an alcohol-ice bath, a very accurate calibration was made which permitted the measurement of one-tenth degree of temperature difference. After certain precautions were taken, it was found that the readings could be considered very reliable. As a result of numerous experiments, it was noted that during the first eight or ten days following each fraction of neutrons a slight cooling of the irradiated areas occurred. During the next forty-eight hours the skin temperature returned to normal, so that for from twelve to fourteen days there was little difference between the irradiated and nonirradiated area. Once the erythema developed, there was a steady increase in the temperature of the irradiated area, although for some time there may have been a slight cooling immediately after the administration of each additional fraction. Finally, before the epidermolysis was seen, there appeared to be no further difference before and after treatment and the temperature remained elevated at all times by as much as 3°C. This behavior of the skin temperature is interpreted by the author as follows:

Vasodilative substances are not formed during the latent period before the appearance of the erythema, as there is no elevation of the skin temperature; however, there is marked vasodilatation when erythema develops. As has been proved by blanching with adrenaline injections, this dilatation of the minute vessels is a reversible reaction. Vascular changes produced by obliteration of the arteries and veins have no definite effect on skin temperature that is due to irradiation, which suggests that an adequate revascularization of the area has taken place. The nervous mechanism controlling flare formation is not affected by the irradiation. T. LEUCUTIA, M.D.

Paul, L. W., and Pohle, E. A.: Radiation Osteitis of the Ribs. *Radiology*, 1942, 38: 543.

The authors observed radiation osteitis with multiple fractures of the ribs in 15 cases of carcinoma of the breast in patients who, following operation, had received prophylactic irradiation. The cases are tabularly arranged.

The irradiation was carried out with a penetration equivalent to 0.2 mm. of copper H.V.L. for the chest field and to 1.05 mm. of copper H.V.L. for the other areas. The four-field technique was used with 2 anterior and 2 posterior portals of entry. The first series consisted of 8 exposures, followed by an additional series of 6 exposures, at intervals of three, four, five, six, and six months. Ten patients received total doses of from 5,200 to 6,000 roentgens per field; the others received somewhat less, the lowest figure being 3,200 roentgens per field over a period of three months.

The changes in the ribs consisted of multiple fractures and a tendency toward nonunion with pseudarthrosis. There was a remarkable absence of pain or other symptoms associated with the development and course of the lesions.

The conclusion reached is that damage to adult bone due to external roentgen therapy is greater than it was formerly believed to be, if the irradiation is carried out with large total doses in repeated series over a period of one or two years.

T. LEUCUTIA, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Williams, R. J.: The Approximate Vitamin Requirements of Human Beings. *J. Am. M. Ass.*, 1942, 119: 1.

The author calls attention to the fact that the development of assay methods for a number of the B vitamins and an accumulation of information from various sources have made it possible to state more definitely the vitamin content of various foods and tissues. Moreover, a study of the vitamin contents of a well rounded, mixed diet for human beings, and of a widely used commercial animal food effective in omnivorous animals shows that these more or less ideal diets contain a relatively constant amount of the various B vitamins.

The approximate human requirements for these vitamins can now be estimated with some reliability. Many American diets are, doubtless, low in these essentials. Attempts to correct these deficiencies must be made intelligently with a knowledge of the requirements and of the contents of the proposed remedial agents. A survey of vitamin B complex preparations, sold by six representative drug houses, shows that these preparations are in general wholly inadequate the sources of the vitamin B complex.

Williams concedes that several of them may be of value because they are fortified with thiamine, nicotinic acid, or riboflavin, but he points out that they do not contain anything like "balanced" amounts of the various B vitamins. It seems apparent, accordingly, that there must be a large economic waste now involved in the production and sale of preparations of questionable value.

WALTER H. NADLER, M.D.

Ashworth, C. T., and Kregel, L. A.: Changes in the Body Water Partition and Extracellular Electrolytes in Shock. *Arch. Surg.*, 1942, 44: 829.

The authors investigated the changes in body water—extracellular and intracellular—during experimental shock. In shock from the intraperitoneal injection of hypertonic solution of sodium chloride, excess sodium ions in the extracellular fluids raise the osmotic pressure of this phase and cause a transit of fluid from the cell to the interstitial fluid. Thus, an increase in interstitial water and a decrease in intracellular fluid occurs. In hemorrhagic shock, probably because of increased osmotic pressure within the cell, resulting from anoxemia, there is a passage of water from the extracellular to the intracellular phase. In traumatic shock, for an unexplained reason, the cell water decreases and interstitial water increases.

The changes in the volume of body cells, as shown by the volume of intracellular water, corresponds directly with alterations in the size of the red blood cells, i.e., with the mean corpuscular volume.

A parallelism between the concentration of sodium in the extracellular fluid and the volume of extracellular fluid was noted. As interstitial water increased, sodium concentration in the plasma decreased, while the opposite was likewise true.

During shock from trauma or hemorrhage there is a striking reduction in glomerular filtration. Tubular reabsorption of water, and especially of sodium, is increased after shock from hemorrhage, while potassium reabsorption is decreased. In traumatic shock, tubular reabsorption of water and sodium is not increased but may be decreased, while potassium reabsorption tends to be increased. It is thought that these changes in renal tubular function may be related to the function of the adrenal cortex or other water and electrolyte regulators.

In hemorrhagic and traumatic shock a terminal increase in extracellular (plasma) potassium was noted. This is thought to represent an attempt, under the rules of osmosis and semipermeable cell membranes, to equalize intracellular and extracellular osmotic pressure, or to represent a severe injury of cell membrane, perhaps due to anoxemia, with increase in cell permeability. J. M. MORA, M.D.

Kopp, I.: Plasma Proteins in Therapeutic Fever. *J. Lab. Clin. M.*, 1942, 27: 1054.

The changes in the plasma proteins of 9 male patients who were hospitalized for fever treatment of general paresis are reported. No other complicating diseases were present. The age of the patients ranged from forty to fifty-one years. Six men received tertian malaria only; 1 was given artificial fever and malaria, 1 tertian and quartan malaria and typhoid-vaccine fever, and 1 typhoid vaccine only.

Marked changes in the plasma proteins, consisting of a rapid and marked drop in albumin, and fluctuations in globulin and fibrinogen, were observed in fever produced by inoculation malaria. Termination of the fever by quinine was followed by a rapid return to normal values. Fever occurring as a result of typhoid vaccine and the inductotherm caused only slight fluctuation in the plasma-protein fractions. The more marked malaria effect may be due in part to the greater amount and more rapid recurrence of fever; the infection process, itself, seems the most important factor interfering with the synthesis of albumin in the liver despite an apparently adequate dietary intake. The more marked increases in globulin noted during malaria were ascribed to the presence of an infectious process and the destruction of red blood cells. Fibrinogen was increased both during malaria and typhoid-vaccine fever. The progressive fall in fibrinogen occasionally noted during malaria is probably due to liver damage. WALTER H. NADLER, M.D.

Moehlig, R. C., and Jaffe, L.: A Syndrome Simulating Diabetes Insipidus in Dogs Induced by Desoxycorticosterone Acetate. *J. Lab. Clin. M.*, 1942, 27: 1009.

A syndrome of polydipsia and polyuria was induced in 2 dogs by comparatively large doses of desoxycorticosterone acetate. Profound muscular weakness was noted in the dogs, and they were unable to co-ordinate their muscles. A pregnant dog which had received the drug for a period of six weeks gave birth to a litter of 7 pups, 5 of which died, 1 lived for a week, and the remaining 1 survived.

Sections of the hypothalamus showed a localized encephalitic reaction, with a plasmacellular infiltration of the leptomeninges and adjacent intracerebral blood vessels. It could not be determined which hypothalamic nucleus particularly was involved. The suggestion was offered that the clinical picture of polydipsia, polyuria, and hypertension might be explained by the changes occurring in the hypothalamus.

A patient with myasthenia gravis, who had an overdosage of the drug, showed the syndrome of polydipsia and polyuria. Marked muscular weakness also was present. In addition, the patient showed symptoms and signs of tetany, which is possibly a new symptom of overdosage.

SAMUEL KAHN, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Williams, J. R.: Does Diabetes Mellitus Predispose the Patient to the Pyogenic Skin Infections? *J. Am. M. Ass.*, 1942, 118: 1357.

The prevailing impression among both physicians and laymen that boils and carbuncles are commonly associated with diabetes, and that the diabetic individual is predisposed to suffer from pyogenic skin infections has been shown to be untrue, both from a clinical study which included 500 patients, and from a review of the available literature. Pyogenic skin infections occur no more frequently in diabetic than in nondiabetic individuals. Since the advent of insulin and the improvement in diabetic management only those diabetics afflicted with a serious complication have sought admission to hospitals. These patients were, for the most part, elderly or middle-aged.

From available data, the author concludes that it is extremely doubtful that diabetes increases the susceptibility to pyogenic skin infections.

ANTHONY F. SAVA, M.D.

DUCTLESS GLANDS

Steiner, P. E.: The Induction of Tumors with Extracts from Human Livers and Human Cancers. *Cancer Research*, 1942, 2: 425.

Twelve sarcomas were induced in 37 mice at the site of subcutaneous injections of the nonsaponifiable lipid fraction extracted from pooled noncancerous livers of persons who died from cancer. The induction time was one hundred and eighty-two days and the percentage yield was 32.4 per cent.

An extract similarly prepared from the livers of noncancerbearing persons had less carcinogenic activity, with an induction time of twelve months and a percentage yield of 14.3. Five sarcomas were induced in 35 mice. Neither of these 2 extracts induced tumors in rats.

A benzene extract of cancerous liver, and various fractions obtained from a benzene extract of cancerous livers failed to induce tumors at the site of injection.

The chemical nature of the carcinogen found in the liver is unknown, other than that it belongs in the general group of the nonsaponifiable lipids. Its origin, whether exogenous or endogenous, likewise has not been determined. An exogenous origin is not excluded because of its presence in the liver. These points are now under investigation.

The author outlines a theory for the chemical causation of cancer, and points out its possible relationship to the theory of chronic irritation.

SAMUEL H. KLEIN, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Baumberger, J. P., Suntzeff, V., and Cowdry, E. V.: Methods for the Separation of Epidermis from Dermis and Some Physiological and Chemical Properties of Isolated Epidermis. *J. Nat. Cancer Inst.*, 1942, 2: 413.

A major project in the Barnard Hospital, St. Louis, is to discover the changes that epidermal cells undergo when they become malignant after repeated treatment with methylcholanthrene. Thus far investigations have been made on (1) alterations in cellular and nuclear size, (2) the intranuclear viscosity, (3) the mitotic index, (4) the response to colchicine, and (5) the influence on carcinogenesis of variations in the application of methylcholanthrene. In these studies, the changes observed were localized in the epidermis microscopically by the study of sections.

The purpose of the experiments described in this article was to improve methods for the separation of epidermis from dermis, so that epidermis might be collected in a suitable condition for analysis by itself without the variable amounts of dermis which have in the past greatly complicated the interpretation of most chemical studies of the skin.

Students of the cancer problem have realized the great handicap of being obliged to work with skin as a whole. Efforts to remove the epidermis mechanically have been only partly successful. Because of the fact that dermal papillae often project up into the epidermis, it is almost impossible, even in the case of frozen skin, to cut away the epidermis with a razor or a microtome knife without taking some dermis.

The authors found that epidermis can be loosened from the underlying dermis by treatment of the skin

with isosmotic NH_4OH for thirty-five minutes, or by an increase of temperature to 50° C. for two minutes. It can then be easily removed in a complete sheet by blunt dissection. In the case of human skin, only the lower portion of the hair follicles and the deeply seated bodies of the sweat and sebaceous glands remain in the dermis. In epidermal methylcholanthrene carcinogenesis of mice, these methods yield complete sheets of epidermis plus appendages up to the time when the epidermal cells break loose and invade the dermis.

The epidermal tissues thus treated are not killed, but are only temporarily loosened by both NH_4OH and heat. If not removed promptly, they again become affixed to the dermis. Epidermis, isolated by both the NH_4OH and heat methods and placed in respiration chambers, continues to consume oxygen. For some kinds of chemical analysis, the heat technique is superior because the tissue is not brought into contact with any aqueous solution and there is no loss of material from it; but by the NH_4OH technique, either the entire epidermis or the epidermis distal to the basal layer of cells may be removed. An opportunity is thus afforded for a chemical comparison of the basal layer with the whole epidermis.

The methods of separation described are not substitutes for the dilute acetic-acid technique. The latter technique is distinctly superior for mitotic counts, for a study of the morphology of the epidermis, and probably for other purposes. By the acetic-acid technique, all the living epidermal cells are suddenly killed before the tissue is subjected to the slight mechanical manipulation necessary to remove it from the dermis. Consequently the appearance of the cells is more uniform than that of the cells in an epidermis separated by ammonium or by heat and subjected to various injuries unequally inflicted before fixation for sectioning and staining.

Through these new techniques it is possible that valuable data can be secured on alterations in permeability, oxygen consumption, and other fundamental properties that are modified during development and pathogenesis. JOSEPH K. NARAT, M.D.

Phillips, C.: Multiple Skin Cancer. A Statistical and Pathological Study. *South. M. J.*, 1942, 35: 583.

A statistical and pathological study has been made of the occurrence of 704 microscopically verified skin cancers occurring multiply in 226 white persons living in Texas and adjoining states. One hundred and thirty-six of these patients had 2 cancers each, 36 had 3, 22 had 4, 18 had 5, 7 had 6, while some of the remainder had up to 23 cancers, the highest in the series. The 704 separate lesions occurred in patients between twenty and eighty-nine years of age, the highest incidence being reached in the sixth decade. It is quite interesting to note that work entailing the most outdoor life with sun exposure gave the highest skin-cancer rate.

In the 212 cases in the "epithelioma group," 130 patients reported on the degree of natural skin pigmentation, using the terms "blond," "brunet," and "mixed" for ease of classification by the patients themselves. One-half of the group reported themselves as blonds. The 10 leading sites of the growths included 95.6 per cent of the whole series and, with the exception of 18 cancers on the hand, they were all about the head and neck. Two hundred and thirty, or 34.2 per cent of the whole, were on the face, while 109, or 14.7 per cent, were on the neck.

Two hundred and twenty-six persons had a total of 704 individual skin cancers, and these fell into 6 separate histological types. The series of ordinary growths called the "epithelioma group" included 670 lesions, while there were, in addition, 33 melanomas which occurred in 14 patients. There were 355 basal-cell epitheliomas, 295 squamous-cell epitheliomas, 10 epitheliomas of mixed basal and squamous form, 10 transitional-cell epitheliomas, 1 adenocarcinoma (of the sweat glands), and 33 melanomas. The basal-cell type made up 52.9 per cent of the "epithelioma group" (670 growths), while the squamous-cell type was present in 44.02 per cent of the same group. Four and one half per cent of the entire group of lesions were melanomas.

Eighty-four and one-tenth per cent of the 704 separate lesions were excised by cauterization. In the remainder of the group the cautery had been supplemented by radium, x-rays, and gland dissection in various combinations. While cauterization leaves scars, the long list of cures of verified lesions traced over many years commends it as an effective agent for destroying cancer.

As to a difference between lesions of multiple type and those of single occurrence the figures show no essential difference in location, age, occupation, skin pigmentation, and histological structure.

JOSEPH K. NARAT, M.D.

HOSPITALS; MEDICAL EDUCATION AND HISTORY

Case, L. B.: Researches in Industrial Hygiene—Outline of Recent Developments. *Indust. M.*, 1942, 11: 250.

The various investigations mentioned briefly in this report can be found in publications which are all of convenient access.

Carbon monoxide. This gas is a classical poison. The American Standards Association has recommended a maximum allowable concentration of this gas of 100 parts per 1,000,000 for exposures not exceeding eight hours daily, and 400 parts per 1,000,000 for exposures not exceeding one hour daily, provided the oxygen is not less than 19 per cent.

This recommendation is based upon information from the U. S. Public Health Service.

Dermatitis. It is frequently stated that dermatitis is the most prevalent of all occupational ailments. In spite of the importance of this subject, there are not available any recent systematic investigations.

Dusts. Silica has been and apparently continues to be the principal item of interest among the various

kinds of dust. Recent experiments have related to the influence of particle-size dust and to the tendencies of other kinds of dust to retard the development of silicosis. Experiments have indicated that particles of silica larger than 3 microns may not be very important. Particles of silica of approximately 1 micron are especially detrimental when injected into the veins of rabbits. Investigation on the percentage of particles of different sizes removed from dust-laden air by breathing indicates that about 25 per cent of the particles of 0.2 microns and about 80 per cent of 2 microns are removed. Larger sizes are removed even more completely. Removal by breathing does not, of course, necessarily involve prolonged retention. The settling rates of several varieties of dust and mixtures thereof have been studied. The results emphasize that settling rates are influenced by numerous factors. The possibility of preventing or retarding the development of silicosis by powdered metallic aluminum, aluminum hydroxide, iron oxide, coal, and other substances has been the subject of a number of experimental investigations. An apparent alleviation in 10 of 14 cases of human silicosis to which powdered aluminum was administered by inhalation is reported. The chief value of aluminum appears to be prevention rather than alleviation. An extensive series of experiments deals with the response of peritoneal tissue to industrial dust. The dusts used fall into 3 groups: (1) dusts causing an absorptive reaction; (2) dusts causing a proliferative reaction; (3) dusts causing an inert reaction. An absorptive reaction may indicate that a dust is relatively harmless, while a proliferative reaction, characteristic of quartz, may be associated with the ability to produce pulmonary fibrosis. Dusts of the inert group, that is, those that show a tendency to remain in the tissues, should be considered as potentially harmful, but not so dangerous as those causing a proliferative response. Two commonly used abrasives, aluminum oxide and silicon carbide, are in the inert dust group. Jewelers' rouge, which is principally an oxide of iron (ferric oxide), is classified in the inert group. Tripoli is placed in the proliferative group.

Fatigue. The physiological, psychological, mechanical, chemical, and economic factors in fatigue have been the subject of much study and of much experimentation. Excessive fatigue is obviously detrimental. Apparently the investigations to date have not progressed sufficiently to indicate a basis for deciding what is reasonable or proper in every situation which may arise.

Lead. This metal continues to be one of the principal subjects of hygiene interest. Experiments relating to ingestion and excretion of lead show that elimination of lead proceeds slowly after discontinuance of its administration. The comparatively slow rate of elimination may be interpreted to indicate that the lead is retained in a rather stable form of combination. Different compounds of lead have different degrees of toxicity. Observations made under shop conditions indicate a rather high tolerance for lead chromate. Lead arsenate as a spray for fruit trees has been investigated, but there does not appear to have been a very serious amount of lead absorption among apple orchardists or among the consumers of the fruit. It is indicated that the substance of the apple is capable of affording protection against the toxic effects of lead. Seven hundred and sixty men employed in a storage battery industry were examined. In 177 of these, a combination of clinical and laboratory findings indicated a condition referable to lead absorption. Three hundred and sixty samples of dust were collected and analyzed to determine the amounts of lead in the air of the work rooms. The results are interpreted to confirm the previously recommended limit of 1.5 mgm. of lead per 10 cubic meters of air. A measurement of industrial lead exposure was made by determination of the stippling of the erythrocytes, and the interpretation was that stippled cells are not a reliable criterion of lead absorption or of the milder forms of lead intoxication. Comparatively high ratios of stippling were found quite frequently in healthy men who had had no industrial exposure to lead. The data demonstrated cyclic variation in stippling among healthy unexposed individuals. Lead absorption, as shown by analysis of the blood and urine, was not always accompanied by unusual stippling in men who had been exposed in varying degrees.

Magnesium. Investigations showed that when magnesium or high-magnesium alloy was introduced into or beneath the skins of animals, gaseous tumors resulted. It has been recommended that splinters of magnesium be removed thoroughly. The fire and explosion hazards involved in the machining and grinding of magnesium alloys has been investigated. Hard granulated pitch has been suggested as a means of controlling magnesium fires in factories, and minimizing damage from incendiary bombs.

Manganese. The effects of absorption of excessive amounts of manganese are reported to be disabling and incurable.

Mercury. The use of compounds of mercury in the manufacture of felt hats has been discontinued.

Radioactivity. The use of powerful x-ray equipment for detecting flaws in castings and in welds has led to the measurement of radiation and the value of concrete as a protective agency. The Bureau of Standards has investigated the matter and has specified a maximum of 0.1 roentgens per day and a maximum of from 10 to 11 curies of radon or thoron per liter of air.

Solvents. Gasoline intoxication is of especial interest. The term "gasoline" refers to mixtures having variable compositions, and the effects produced are also variable. There is a question as to the limit of 1,000 parts per 1,000,000 as being safe. The toxicity and potential dangers of toluene have been investigated, and there is an inclination to question the commonly accepted limit of 200 parts per 1,000,000. Further experiments will be conducted.

Methods of testing. There has been a tendency during recent years to use physical methods rather

than chemical procedures. The equipment is more expensive and calibrations frequently are quite complicated, but these disadvantages are compensated adequately by the number of tests that can be made within short periods of time. The spectrograph, which is used to analyze the light emitted at high temperatures by a variety of elements, is an effective qualitative tool. Spectrophotometry is a phase of the larger art of spectroscopy. Light of a suitable wave length is passed into the substance being tested and the amount of light absorbed is determined. This principle has been recommended for the determination, in air, of the vapors of various substances, including mercury, xylene, toluene, benzene, tetrachlorethylene, trichlorethylene, carbon disulfide, hydrogen sulfide, and gasoline. A slender beam of x-rays passing through certain substances is scattered in a manner which is characteristic for the substance. When the procedure is properly controlled the amount of substances may be estimated by comparing the intensities of lines produced on photographic emulsions. The polarograph passes a small electric current through a dilute solution of the substance or substances being estimated. The principal feature of the apparatus is the "dropping mercury electrode." A curve showing the relation of current to voltage is plotted, either automatically or manually. Irregularities occur in this curve as the voltage is changed. The position of an irregularity with respect to the voltage scale is characteristic of the substance producing it, and the magnitude of the irregularity is a function of the concentration of the substance producing it. A sensitive procedure has been developed for the determination of ozone and nitrogen dioxide in the atmosphere. The gases are absorbed on specially prepared silica gel, while cooled in liquid air, and subsequently separated by distillation at minus 120° C. The amounts of ozone found in out-door air varied from approximately 1 to approximately 4 parts per 100,000,000. The concentrations of nitrogen dioxide were somewhat less. Continuous automatic apparatus has been designed for recording the concentrations of several atmospheric contaminants, including carbon disulfide and hydrogen sulfide.

Ventilation. This subject has not been neglected. However, an attempt to summarize it for this purpose would be too voluminous.

Welding. Elaborate investigations have been conducted with respect to possible physiological effects on people. Animals have been exposed to the gases and fumes from bare electrodes and also from coated electrodes. No evidence of respiratory inflammation was observed. A number of production welders were examined at a time when the nitrogen-dioxide concentration was only 13 parts per 1,000,000 and methemoglobinemia was found. The concentrations of fumes commonly found in industry probably are not harmful. Examination of 286 welders who had had an average length of service of nine years showed no disabilities or diseases characteristic of the occupation of welding. A series of animal experiments on the effects of arc-welding fumes on the susceptibility to tuberculosis showed no increase in susceptibility. Some welding fluxes contain compounds of fluorine, and experiments have been made on the metabolism of fluorides. Small amounts ingested in food are eliminated. Storage occurs, however, when larger amounts are administered. The retention occurs largely in the bones. Roughness and other abnormalities are produced. These changes were not revealed by x-ray examination but were readily seen when the jawbones of sacrificed animals were examined. The retained fluorine is not released, or the release takes place at an exceedingly slow rate.

J. Daniel Willems, M.D.